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REVIEW OF THE GENUS *MICROGNATHUS* DUNCKER (PISCES: SYNGNATHIDAE), WITH DESCRIPTION OF *M. NATANS*, N. SP.

C. E. Dawson

Abstract.—The urophorine (tail-pouch) pipefish genus *Micrognathus* Duncker is reviewed and four Indo-Pacific and one Atlantic species are recognized. Other nominal species usually included in *Micrognathus* are provisionally referred to the genus *Halicampus* Kaup. *Micrognathus natans* n. sp., characterized in part by a modal count of 14 trunk rings, is described from the Philippines, eastern Australia, New Caledonia, and the Fiji Islands. Other Indo-Pacific species include the type-species, *M. brevirostris* Rüppell, *sensu* Kaup, 1856), *M. andersonii* (Bleeker), and *M. micronotopterus* (Fowler). Two of these (*andersonii, micronotopterus*) typically lack protruding, hook-like, posterior angles on the tail rings, whereas rings on the distal half or more of the tail have prominent hook-like spines or points in *M. brevirostris*. *Micrognathus andersonii* (modally 16 trunk rings) ranges from the northern Red Sea to Japan (Honshu Is.), Samoa and Tonga, whereas *M. micronotopterus* (modally 15 trunk rings) is known from northern and western Australia, western Indonesia, Singapore and the Philippines. *Micrognathus brevirostris* includes two subspecies, *M. b. brevirostris* in the Red Sea and *M. b. pygmaeus* in NE Australia, eastern Indonesia, Marshall Is. (Bikini) and Tahiti. These subspecies share a modal count of 15 trunk rings, but differ in preserved coloration, as well as in numbers of pectoral-fin rays and subdorsal tail rings (respectively, 9–11 and 3.75–4.75 versus 10–13 and 2.75–4.0 in *pygmaeus*). There are no confirmed Indian Ocean records of any species of *Micrognathus* between Madagascar, the SE tip of India and the NW coast of Australia. The single Atlantic species (*M. erugatus*), characterized by 20 trunk rings, is known only from the Brazilian type locality. A key is provided, each taxon is diagnosed and illustrated, and maps delineate distributions of Indo-Pacific species as determined from materials examined.

The genus *Micrognathus* Duncker, 1912 has never been differentiated adequately from other urophorine (tail-pouch) pipefish genera with the same configuration of principal body ridges (e.g. *Halicampus* Kaup, *Trachyrhamphus* Kaup), and has never been subject to critical taxonomic study. Herald and Randall (1972) included three subgenera and some 15 species in *Micrognathus*, and three additional species have since been described from Atlantic and Pacific waters (Herald and Dawson 1974, Dawson and Allen 1981, Fritzsche 1981). Many nominal species lack an adequate diagnosis or description, available figures are often poor, and correct identification of individual specimens is often difficult or impossible. In fact, the identity of the type-species (*Syngnathus brevirostris* Rüppell) is uncertain, and at least three taxa are commonly identified in collections and the literature as *Micrognathus brevirostris*. This review, based on examination of available museum material, recognizes four species of *Micrognathus* in the Indo-

Pacific region and one species (*M. erugatus* Herald and Dawson) in the western Atlantic Ocean. One Indo-Pacific species is described as new, two [*M. andersonii* (Bleeker), *M. micronotopterus* (Fowler)] are resurrected from synonymy, and *M. brevirostris* is considered to include one subspecies in the Red Sea and another in the western Pacific Ocean.

Methods and Materials

Measurements are in millimeters (mm) and some are referred to standard length (SL), total length (TL) or head length (HL). Counts of trunk rings begin with that bearing the pectoral fins and end with that bearing the anus (anal ring); all fin-rays are counted separately; subdorsal rings are estimated to the nearest 1/4-ring interval before (+) and after (−) the anterior margin of the 1st tail ring (0-point). As employed here, the term "venter" refers to the ventral surface of head or body; color descriptions are from specimens preserved in alcohol; other methods are those of Dawson (1977). Care must be taken in counting the number of trunk rings, since any error may result in misidentification. Materials examined are listed by general localities from west to east and roughly north to south; depths are in meters (m); maps delineate general localities and each symbol represents one or more collections.

Abbreviations for repositories of materials examined are: AMNH—American Museum of Natural History, New York; AMS—Australian Museum, Sydney; ANSP—Academy of Natural Sciences of Philadelphia; BMNH—British Museum (Natural History), London; BPBM—Bernice P. Bishop Museum, Honolulu; CAS—California Academy of Sciences, San Francisco; CAS-SU—Stanford University collections, now at CAS; CSIRO—CSIRO New South Wales Fisheries Laboratory, Cronulla; FMNH—Field Museum of Natural History, Chicago; GCRL—Gulf Coast Research Laboratory Museum; HUJ—Hebrew University of Jerusalem; KFRS—Kanudi Fisheries Research Station, Papua New Guinea; MCZ—Museum of Comparative Zoology, Harvard University, Cambridge; MNHN—Muséum National d'Histoire Naturelle, Paris; MZUSP—Museu Paulista, Universidade do São Paulo; NMW—Naturhistorisches Museum, Vienna; NTM—Northern Territory Museum, Darwin; QM—Queensland Museum, Brisbane; RMNH—Rijksmuseum van Natuurlijke Historie, Leiden; RUSI—J. L. B. Smith Institute of Ichthyology, Grahamstown; SAM—South African Museum, Cape Town; SIO—Scripps Institution of Oceanography, La Jolla; SMF—Natur-Museum und Forschungs-Institut Senckenberg, Frankfurt am Main; TAU—Tel-Aviv University; UG—University of Guam, Agana; UMMZ—Museum of Zoology, University of Michigan, Ann Arbor; USNM—National Museum of Natural History, Smithsonian Institution, Washington, D.C.; UWCF—University of Washington College of Fisheries, Seattle; WAM—Western Australian Museum, Perth; YCM—Yokosuka City Museum; ZMA—Zoölogisch Museum, Amsterdam; ZMB—Zoologisches Museum, Museum für Naturkunde der Humboldt-Universität, Berlin; ZMUC—Zoologisk Museum, University of Copenhagen.

Micrognathus Duncker

Micrognathus Duncker, 1912:235 (type-species, *Syngnathus brevirostris* Rüppell 1838, by original designation).

Diagnosis.—Superior trunk and tail ridges discontinuous near rear of dorsal-fin base, not arched strongly dorsad below dorsal-fin base in subadults-adults; inferior trunk ridge and lateral tail ridge end near anal ring; lateral trunk ridge confluent with inferior tail ridge; venter of trunk V-shaped, the median ridge distinct but not enlarged or keel-like. Median dorsal snout ridge low, entire, somewhat concave in lateral profile, originating on anterior half of snout, ending on or before middle of interorbital, not confluent with orbital ridges; lateral snout ridge absent; dorsal rim of orbit somewhat elevated; interorbital concave or a little depressed; prenuchal, nuchal and frontal ridges low, arcuate, essentially entire; principal (longitudinal) opercular ridge complete in young, usually incomplete or infrequently obsolete in adults, ridge straight or angled upward toward gill opening; other head ridges low, mainly entire; head without spines, knobs, denticules or serrations. Principal trunk ridges low to somewhat elevated, without prominent indentations or notches between anterior and posterior margins of rings; dorsum often a little depressed between superior trunk ridges; tail rectangular in section or with principal ridges angled progressively laterad toward caudal fin and with surfaces depressed or concave between; ridges notched or indented between rings; posterior angles of tail rings not produced strongly (Figs. 1a, b) or forming prominent hook-like projections (Fig. 1c); ridge margins entire, granular or rough, never clearly denticulate or serrate; scutella without longitudinal keels; dermal flaps absent from eye, usually present on head and/or body, generally small, never greatly enlarged or profusely branched; dorsal-fin origin between anterior margin of penultimate trunk ring and posterior margin of 1st tail ring, fin-base not clearly elevated in subadults-adults; pectoral and caudal fins small, rounded; anal fin present. Trunk rings 14–20, total rings 41–56, total subdorsal rings 3.25–5.75, dorsal-fin rays 16–24, pectoral-fin rays 9–15, anal-fin rays 2–4, caudal-fin rays typically 10. Head length 6.9–11.3 in SL, snout length 2.2–4.0 in HL, length of dorsal-fin base 0.9–1.9 in HL (data from subadults-adults). Brood pouch located below anterior 10–18 tail rings; pouch plates little enlarged; pouch folds present; pouch closure the everted type of Herald (1959); brood-pouch eggs deposited in 1–2 layers and in 1–7 transverse rows. Without odontoid processes in jaws (Dawson and Fritzsche 1975) or bony inclusions in gill membranes (Dawson 1978); all branchial elements, except 3rd basibranchial, present (Fritzsche 1980).

Comparisons.—Among urophorine (tail-pouch) pipefish genera, the principal body ridge configuration of *Micrognathus* and combined presence of a 10-rayed caudal fin, an anal fin, a brood pouch with both pouch plates and folds, and a non-prehensile tail are shared only with *Halicampus* Kaup. These taxa differ principally in the development and ornamentation of head and body ridges, and in the type and development of dermal flaps. *Micrognathus* is in part characterized by a low, entire, median dorsal snout ridge, absence of a lateral snout ridge, absence of strongly elevated head or trunk ridges, and absence of spines, denticules or serrations on the head or trunk. In contrast, species of *Halicampus* have an elevated and/or spiny median snout ridge, the lateral snout ridge or spine is usually present, spines are often present elsewhere on the head, and the head and trunk ridges are often elevated strongly with denticulate or serrate margins. In *Micrognathus,* dermal flaps are absent from the eye and are elsewhere usually small, slender, and little branched. Dermal flaps are present on the eye of most

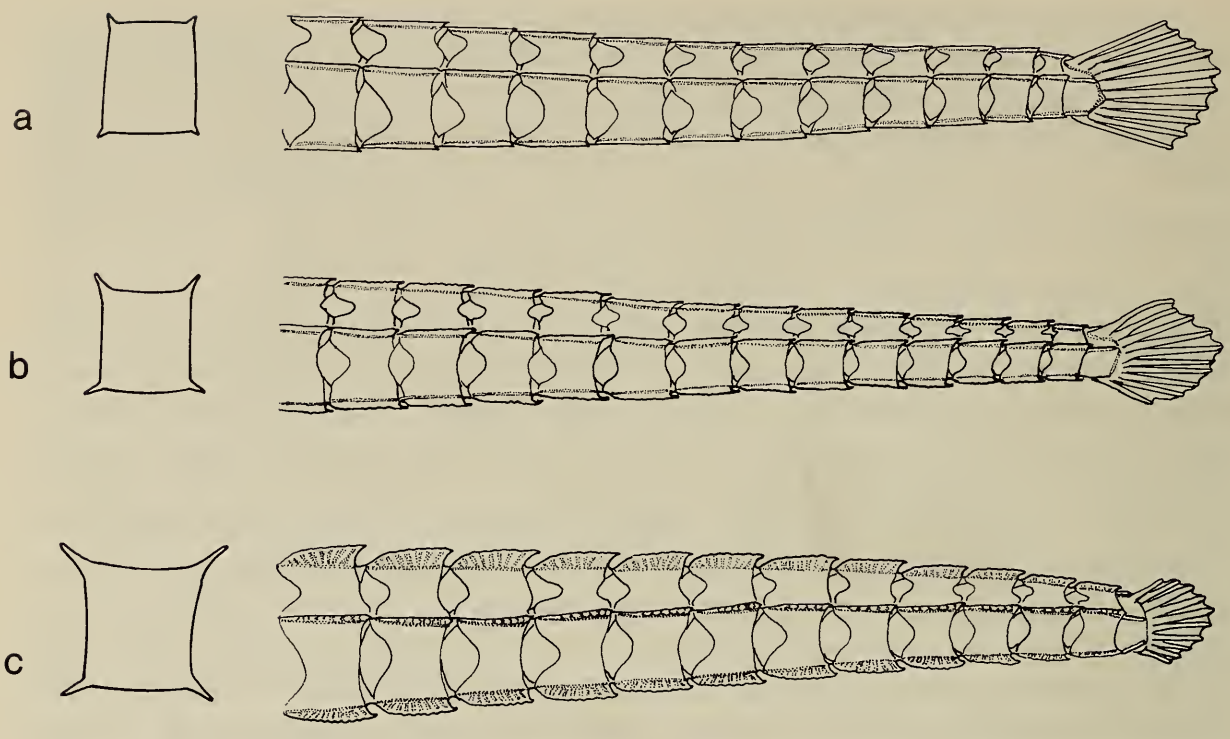

Fig. 1. Cross-sectional and oblique-longitudinal aspects of distal portion of the tail in species of *Micrognathus*. a–b: *M. andersonii, M. erugatus, M. micronotopterus, M. natans*; c: *M. brevirostris*.

species of *Halicampus* and those on the head and body are often large, sometimes spatulate, and frequently multi-branched. Duncker (1915) noted that the dorsal-fin base is low in *Micrognathus* and elevated in *Halicampus,* but this appears to be a shared character, albeit less obvious in *Micrognathus*. In *Micrognathus,* young fish may have a somewhat elevated dorsal-fin base, and young and some adults may have the superior trunk ridge arched a little dorsad below the dorsal-fin base.

Remarks.—Herald (1953) included two subgenera, *Anarchopterus* Hubbs, 1935 (type-species, *Siphostoma crinigerum* Bean and Dresel) without anal fin and *Micrognathus* (with anal fin), in the genus *Micrognathus*. Subsequently, Herald and Randall (1972) introduced *Minyichthys* (type-species, *Micrognathus brachyrhinus* Herald) as a third subgenus, differentiated only by high numbers of trunk rings (19–21 versus 13–17), a "very short snout" and small size at maturity (<50 mm SL). Dawson and Allen (1981) restored generic rank to *Anarchopterus,* and Dawson (1982) treated *Minyichthys* as a genus, characterized in part by an 8-rayed caudal fin. Species included in the remaining subgenus (*Micrognathus, sensu* Herald and Randall 1972) share a high degree of consistency in numbers of trunk rings (maximum range of 3 for any species), but exhibit considerable variation in gross morphology and include at least two lineages of somewhat similar pipefishes. One of these, represented by the genus *Micrognathus,* includes the species treated here. All other species, including the western Atlantic *M. crinitus* (Jenyns, 1842), *M. spinirostris* Dawson and Allen, 1981, and the remaining Indo-Pacific members of Herald's (1953) subgenus *Micrognathus,* are provisionally referred to the genus *Halicampus* Kaup. *Micrognathus* and *Halicampus* are similar in many respects and may prove to differ only at the subgeneric level. However, I

retain generic rank for *Micrognathus* pending completion of studies on *Halicampus*.

Although problems exist with the identity of the type-species of *Micrognathus* (see Remarks under *M. b. brevirostris*), common usage argues strongly for preservation of Duncker's genus name, and *Syngnathus brevirostris* Rüppell (*sensu* Kaup 1856) is provisionally accepted as the type-species of *Micrognathus*. In addition to sharing features diagnosed above, these pipefishes are small (probably seldom exceeding 80 mm SL), some are locally abundant, and all but one species (*natans*) are known to occur in tidepools and shallow reef or shore habitats. Distribution of Indo-Pacific species extends from the northern Red Sea to Japan (Honshu Is.), the Marshall Is. (Bikini) and Tahiti. However, within the Indian Ocean, the genus is known only from the eastern coast of Africa, Madagascar, the southeastern tip of India, western Indonesia and northwestern Australia.

Key to the species and subspecies of *Micrognathus*

1. Trunk rings 14–17 (Indo-Pacific) 2
– Trunk rings 20 (western Atlantic) ..... *erugatus* Herald and Dawson
2. Trunk rings usually (in 93% of specimens examined) 14, snout depth in snout length 2.9–4.0 ($\bar{x}$ = 3.4) ..... *natans* n. sp.
– Trunk rings usually (in 99.9%) 15–17, snout depth in snout length 1.6–3.1 (usually <3.0) 3
3. Trunk rings 14–16 (15 in 99%) 4
– Trunk rings 15–17 (16–17 in 99.7%) ..... *andersonii* (Bleeker)
4. Principal tail ridges angled laterad (Fig. 1c), dorsal-fin rays 18–21 (19–21 in 92%), snout length averages 3.0–3.1 in HL 5
– Principal tail ridges not angled laterad (Fig. 1a), dorsal-fin rays 17–19 (17–18 in 94%), snout length averages 2.6 in HL ..... *micronotopterus* (Fowler)
5. Subdorsal tail rings 3.75–4.75 (4.0 or more in 85%); pectoral-fin rays 9–11; opercle without minute dark spots or ocellus, often with narrow pale bars (Red Sea) ..... *brevirostris brevirostris* (Rüppell)
– Subdorsal tail rings 2.75–4.25 (3.75 or fewer in 92%); pectoral-fin rays 10–13; opercle without narrow pale bars, often with pale-margined ocellus and/or minute dark spots in subadults and adults (W Pacific) ..... *brevirostris pygmaeus* Fritzsche

Micrognathus brevirostris (Rüppell)

Diagnosis.—Trunk rings modally 15, principal ridges angled laterad on distal half of tail, dorsal-fin rays 18–21 (usually 19–20), snout length averages 3.0–3.1 in HL.

Description.—See subspecies.

Comparisons.—Characters in key and diagnosis distinguish *M. brevirostris* from congeners. Additionally, *M. brevirostris* lacks dark blotches above the lateral trunk ridge (often present in *M. andersonii* and *M. micronotopterus*) and has a higher average HL in SL ratio than *M. natans* (*ca.* 9.4 versus 7.4).

Remarks.—As interpreted here, *M. brevirostris* includes one subspecies in the Red Sea and another in the western Pacific Ocean. These are distinguished by

differences in some meristic and proportional values, as well as in preserved coloration (see key and diagnoses of subspecies).

Micrognathus brevirostris brevirostris (Rüppell)
Figs. 2–4

Syngnathus brevirostris Rüppell, 1838:114 (orig. descr.; Massaua, Red Sea).

Diagnosis.—Subdorsal tail rings usually 4.0–4.75, pectoral-fin rays usually 10, without minute dark spots on opercle, side of head often with irregular narrow bars.

Description.—Rings 14–16 + 28–31 (15 + 28–31 in 95%), dorsal-fin rays 18–21, pectoral-fin rays 9–11 (modally 10), anal-fin rays usually 3, subdorsal rings 1.25–0.25 + 3.75–4.75 = 4.25–5.5 (see Tables 1–3 for additional counts). Proportional data, based on 19 specimens 36.0–62.0 ($\bar{x}$ = 45.8) mm SL follow: HL in SL 8.7–11.3 (9.7), snout length in HL 2.9–4.0 (3.1), snout depth in snout length 1.6–2.3 (2.0), length of dorsal-fin base in HL 1.0–1.2 (1.1), pectoral-fin length in HL 3.7–6.0 (4.5), length of pectoral-fin base in pectoral-fin length 1.2–2.0 (1.7), anal ring depth in HL 2.0–2.6 (2.3), trunk depth in HL 1.6–2.1 (1.9). Longitudinal opercular ridge essentially complete in larvae and juveniles, incomplete (Fig. 2) or occasionally obsolete in adults. Distal half or more of tail with principal ridges angled or flared laterad and with posterior angles of rings produced to form hook-like points (Fig. 1c); dermal flaps usually short, typically slender, usually simple but sometimes with 1–2 subterminal branches or bifurcate distally.

Ground color pale to dark brown in subadults–adults; both pale and dark specimens may occur in a single collection, irrespective of sex or state of maturity; eye usually with indications of dark bars radiating from pupil. Pale fish usually have some brownish shading on side and venter of head and on lower half of trunk; some have head and body mottled with tan; fins mainly hyaline. Dark specimens may be plain or peppered with minute pale spots, dorsal and pectoral fins are brownish and caudal fin is brown with pale distal margin. Among 23 recently preserved fish, 19 (83%) have diffuse dark spots on or near the lateral, inferior and median ventral ridges of the anterior 6–12 trunk rings. Arrangement of spots, a vertical row of patches of dark microchromatophores, suggests that the lower half of the trunk is barred in life. Additionally, recently preserved specimens often have several to many narrow, irregular, pale bars or lines on the side of the snout, suborbital and opercle; these markings may extend above the opercle and on the venter of the head.

Comparisons.—*Micrognathus b. brevirostris* differs from *M. b. pygmaeus* in having fewer pectoral-fin rays (modally, 10 versus 11–12) and in having a higher average number of subdorsal tail rings (4.2 versus 3.4). These subspecies evidently share the presence of bars on the lower half of the trunk, but *M. b. brevirostris* lacks dark spots on the opercle (usually present in *M. b. pygmaeus* >30 mm SL) and narrow pale bars on the head (present in many *M. b. brevirostris*) have not been found in examined specimens of *M. b. pygmaeus*. These pipefishes are closely related, but the differences noted here and in descriptions, together with allopatric distributions, are sufficient for recognition as subspecies.

Remarks.—Although the above-described taxon was identified with *Syngna-*

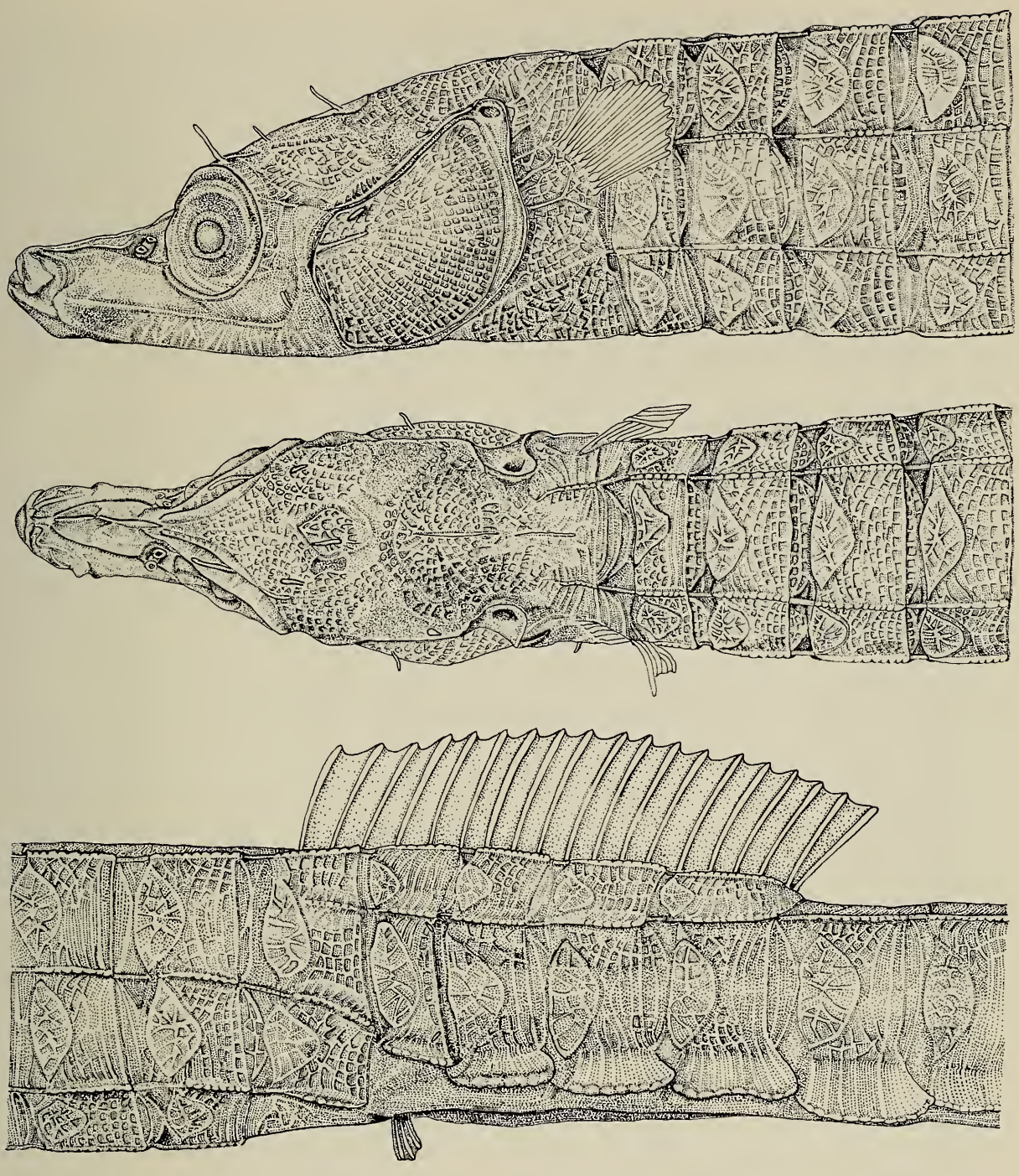

Fig. 2. *Micrognathus brevirostris brevirostris*. Lateral and dorsal aspects of head and anterior trunk rings, together with section of body illustrating ridge configuration and dorsal and anal fins. From 51.5 mm SL, male (BMNH 1860.11.9.60).

thus brevirostris Rüppell by Kaup (1856), and subsequent workers have accepted Kaup's interpretation, the identity of Rüppell's species is uncertain. Rüppell's (1838) unillustrated original description may be roughly translated:

> Head measures a tenth of the body length and the snout equals a third of the head length; opercle and vertex smooth; the body, although 7-angled, appears cylindrical; there are 18 ring segments between head and anus, 11 along the brood pouch, and 19 in the remainder of the tail; the short caudal fin is rounded; pectoral fin 7; dorsal fin 19; caudal fin 7; body grayish yellow

Table 1.—Frequency distributions of trunk, tail, and total rings in species of *Micrognathus*. * Designates holotype.

	Trunk rings						Tail rings								Total rings									
Species	14	15	16	17	—	20	27	28	29	30	31	32	—	36	41	42	43	44	45	46	47	48	—	56
b. brevirostris	1	39	1					2	15	21	3						3	14	20	4				
b. pygmaeus		73*	1					5	18	45*	6						5	17	46*	6				
andersonii		1	318*	18			3	54*	90	149	38	3					3	54*	83	147	47	3		
micronotopterus		36*						1	10	18	7*						1	10	18	7*				
natans	62*	5					2	4	27*	29	5				2	4	26*	27	8					
erugatus						1*								1*										1*

Table 2.—Frequency distributions of dorsal- and pectoral-fin rays in species of *Micrognathus*. * Designates holotype.

	Dorsal-fin rays									Pectoral-fin rays						
Species	16	17	18	19	20	21	22	23	24	9	10	11	12	13	14	15
b. brevirostris			6	21	12	2				1	43	28				
b. pygmaeus			6*	19	39	8					6*	62*	58	3		
andersonii		1	15	80	136	74	24	2	1			122	322	110		
micronotopterus		17	16*	2							2	25*	36	1		
natans	2	58	2*										13	30*	14	3
erugatus				1*										2*		

Table 3.—Frequency distributions of trunk, tail, and total subdorsal rings in species of *Micrognathus*. Plus (+) indicates dorsal-fin origin in advance of 0-point (anterior margin of 1st tail ring); minus (−) indicates origin on tail. * Designates holotype.

	Subdorsal trunk rings									
Species	+ 1.75	1.50	1.25	1.00	0.75	0.50	0.25	0.00	0.25	0.50 −
b. brevirostris			2	7	11	15	6			
b. pygmaeus		2	2	34*	27	8	3			
andersonii	9	22	55	151	76*	33	3			
micronotopterus		1	3	16*	12	4	1			
natans						3	13	31	11*	5
erugatus				1*						

	Subdorsal tail rings										
	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00
b. brevirostris							6	13	15	4	3	
b. pygmaeus			3	8	25	24	10	5*	1			
andersonii		3	10	31	47	63	58	61	42*	27	5	2
micronotopterus	2	6*	2	11	8	5	3					
natans						2	4	14*	15	20	7	1
erugatus										1*		

	Total subdorsal rings										
	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75
b. brevirostris					5	6	12	11	6	1	
b. pygmaeus			3	23	28	13	8	1*			
andersonii			5	22	63	59	78	70*	38	11	3
micronotopterus	2	4*	9	13	6	3					
natans			1	13*	17	22	9	1			
erugatus										1*	

in alcohol, with numerous lighter spots; edges of body rings unspotted and appear darker; head with some whitish irregular bands; fins dark gray; body length 2.5 inches, from Massaua.

Rüppell's remarks concerning body proportions, opercle, vertex, 7-angled body, brood pouch, size at maturity, size and shape of caudal fin, and coloration are not diagnostic and could apply to many pipefishes. According to modern methods, occurrence of 18 rings between the head and the anus would result in a count of 19 or 20 trunk rings, but no Red Sea species historically referred to *Micrognathus* has more than 17 trunk rings. Similarly, pectoral-fin rays number 9–15 in all Indo-Pacific taxa previously referred to *Micrognathus*, 19 dorsal-fin rays occur in several Red Sea pipefishes, and 7 caudal-fin rays is an atypical number for any pipefish. No clue is provided to the configuration of the principal body ridges, and, aside from reference to the male, there is no indication of the number of specimens obtained by Rüppell. Subsequently, Kaup (1853, 1856) referred an unstated number of specimens, collected by Rüppell but differing significantly from the foregoing description, to this species (as *Corythoichthys brevirostris*). I have found no evidence to indicate that the specimens treated by Kaup are conspecific with Rüppell's specimen(s) of *Syngnathus brevirostris*.

Fig. 3. *Micrognathus brevirostris brevirostris*. Top, BMNH 1860.11.9.60 (51.5 mm SL male). Middle and bottom, GCRL 18154 (43.5 mm SL male, and 48 mm SL female).

Since Rüppell's (1838) description fails to define any character or character combination diagnostic of any known pipefish, the name *brevirostris* could well be treated as a nomen dubium. This, however, would introduce a number of undesirable nomenclatural problems. Among these would be the suppression of the commonly employed genus name *Micrognathus* Duncker (type-species, *Syngnathus brevirostris* Rüppell) and the introduction of new names for the specimens described as *Corythoichthys brevirostris* by Kaup (1856) and for the other species presently referred to *Micrognathus*. Until such time as a pipefish is found which is clearly identifiable with Rüppell's description, it seems best to consider his description as poorly written and to treat specimens described by Kaup (1856) as representative of *Syngnathus brevirostris* Rüppell. Kaup (1856) gives counts of 14–15 + 30 rings, 5 subdorsal rings, 12 dorsal-fin rays (obviously in error), and notes the presence of this species in the museums at Frankfurt, London, Stuttgart,

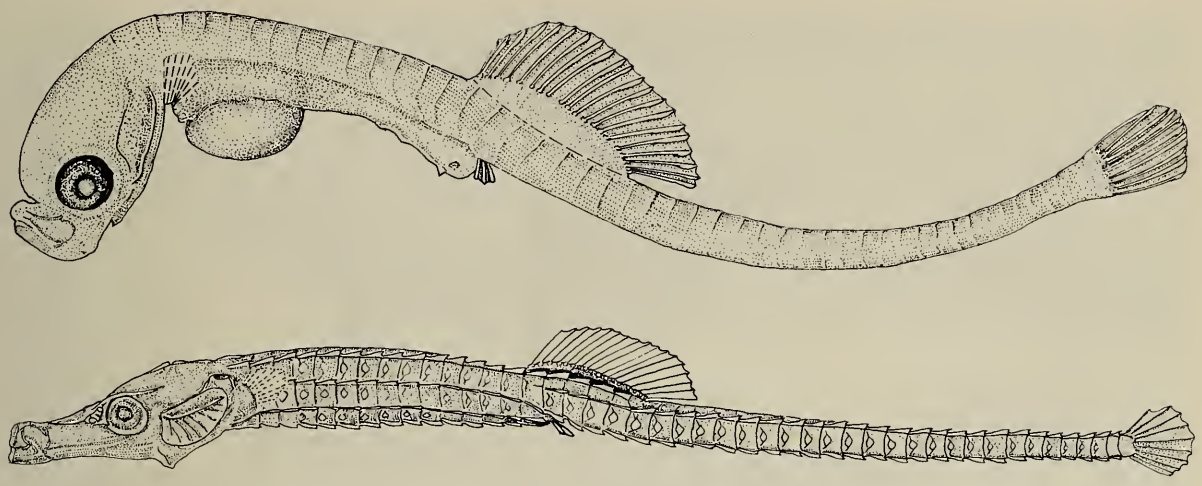

Fig. 4. *Micrognathus brevirostris brevirostris*. Top, Late yolk-sac larva (*ca*. 5.8 mm SL), GCRL 18155. Bottom, Planktonic juvenile (14.9 mm SL), GCRL 17428.

Berlin and Darmstadt. I am unaware of the fate of the specimens at Stuttgart, Berlin and Darmstadt, but there are now 7 possible syntypes, collected by Rüppell at Massaua and identified with *S. brevirostris* by Kaup, in the London and Frankfurt collections. An adult male (BMNH 1860.11.9.60), accompanied by a handwritten internal jar label stating "one of the typical specimens," has 19 dorsal-fin rays and retains traces of patches of melanophores on or near the lateral, inferior and median ventral ridges of the 8–9 anterior trunk rings (Fig. 3). The six remaining specimens, all distorted and in relatively poor condition, consist of one male (SMF 902) and a lot of 5, including one male (SMF 4909–4913).

Among material examined, the brood pouch is developed below the 9–14 ($\bar{x}$ = 11.5) anterior tail rings in 19 males (33–51.5 mm SL), and the smallest brooding male is 33 mm SL. Brood-pouch eggs are usually deposited in 1–2 layers and in two transverse rows. A 36 mm male has 30 eggs in a 10-ring pouch, a 44 mm fish has a single layer of 32 eggs through 12 of 13 pouch rings, and another (42 mm) has 67 early embryos in a 2 × 2 arrangement in a 14-ring pouch. Although late yolk-sac larvae are seldom found in preserved males of any species of *Micrognathus*, 4–5 nearly straight larvae, *ca*. 5.8 mm SL (Fig. 4), were found with several early (coiled) larvae in the partially filled pouch of a 41 mm fish. Configuration of principal body ridges is not distinguishable in these late larvae, but the dorsal and caudal fins are well developed and the pectoral and anal fins are present. Planktonic young (13–15 mm SL) lack dermal flaps, they have pointed posterior angles on most rings, and the dorsal-fin base is a little elevated (Fig. 4). Present materials show no evidence of geographic variation in coloration or meristic values.

Many literature records of *M. brevirostris* from the Red Sea are based, wholly or in part, on misidentifications of *M. andersonii*. Most have not been verified here but two deserve comment. Four fish from Koseir (MCZ 3814, ZMB 7906), collected by Klunzinger and apparently reported as *M. brevirostris* (Klunzinger 1871), are specimens of *M. andersonii*. Similarly, the Red Sea specimen of Dr. Jousseaume (MNHN 93064), reported by Dollfus and Petit (1938), is also a misidentified example of *M. andersonii*.

Distribution.—Micrognathus b. brevirostris is a Red Sea endemic (Fig. 5) known

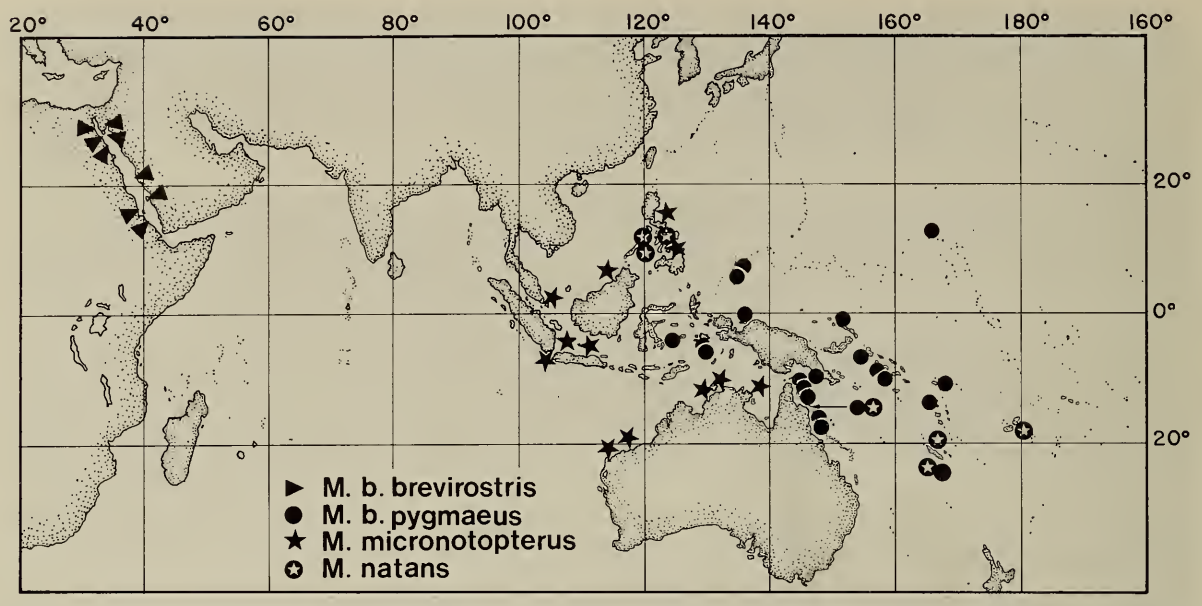

Fig. 5. Distributions of selected species of *Micrognathus* based on material examined. A record of *M. b. pygmaeus* from Tahiti (*ca.* 17°32′S, 149°34′W) is omitted.

from the Gulfs of Suez and Aqaba in the north to the Strait of Perim in the south (*ca.* 12°36′N, 43°16′E). Among present material, there is one lot of offshore planktonic young and two lots of adults taken from clumps of coral (*Stylophora* sp.) collected in 1.5 m. Data accompanying other samples lack useful information on habitat or depth of capture. It is uncertain whether Fishelson's (1971) reference to the occurrence of *M. brevirostris* in the "*Halophila* . . . /*Asymmetron* . . . community" (2–5 to *ca.* 40 m) is based on this species or its only Red Sea congener, *M. andersonii*.

Material examined.—Forty-two specimens (excluding larvae) 13–62 mm SL, including 7 possible syntypes*.

RED SEA, Gulf of Suez: ZMB 20003 (1, 48), ZMB 20004 (2, 44.5–45.5). Gulf of Aqaba: HUJ F.2096 (1, 16.5), HUJ F.6522 (5, 31–36), HUJ F.9258 (1, 17), TAU P.6265 (1, 26). Sinafur Is.: BMNH 1951.1.16.92–94 (3, 36.5–47). Al Ghardaqa (27°13′N, 33°51′E): GCRL 18154 (7, 41–52), GCRL 18155 (5, 41–62). Quseir: NMW 40279 (1, 37.5). Jiddah: RMNH 28610 (1, 40.5). Farasan Is.: SMF 4907 (1, 38.5). Massaua: BMNH 1860.11.9.60 (1, 51.5*), SMF 902 (1, *ca.* 52.5*), SMF 4909–4913 (5, 45.5–53.5*). Ethiopia: GCRL 17428 (2, 13–15). Loc. uncertain: MNHN 52-302 (4, 36.5–46.5), *Calypso*, no other data.

Micrognathus brevirostris pygmaeus Fritzsche
Figs. 6, 7

Micrognathus pygmaeus Fritzsche, 1981:771, fig. 1 (orig. descr.; Taone, Tahiti).

Diagnosis.—Subdorsal tail rings usually 2.75–3.75, pectoral-fin rays usually 11–12, side of head typically without narrow pale bars, subadults and adults usually with minute dark spots on opercle.

Description.—Rings 15–16 + 28–31 (15 + 28–31 in 99%), dorsal-fin rays 18–21, pectoral-fin rays 10–13 (usually 11–12), anal-fin rays usually 3, subdorsal rings

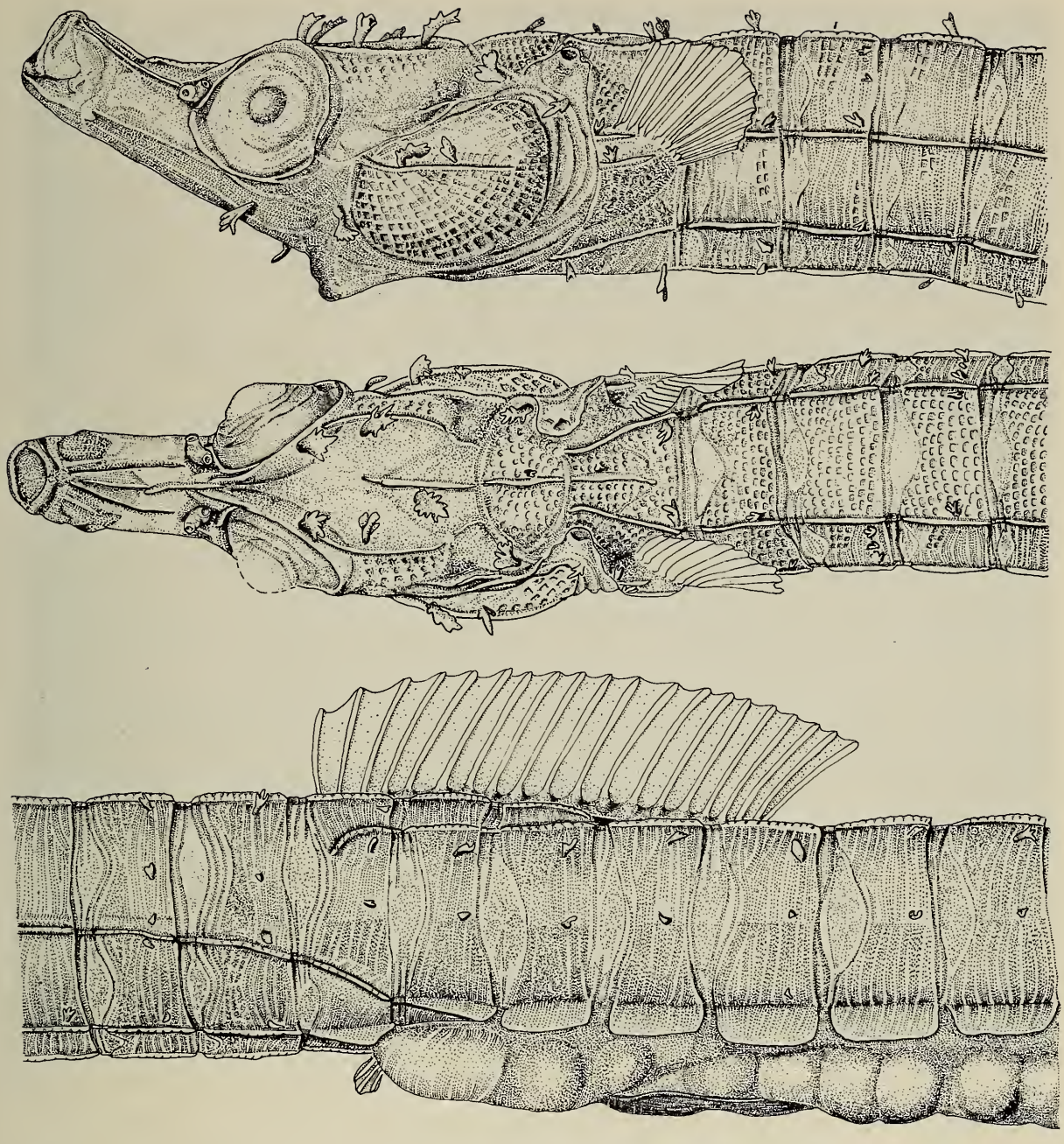

Fig. 6. *Micrognathus brevirostris pygmaeus*. Lateral and dorsal aspects of head and anterior trunk rings, together with section of body illustrating ridge configuration and dorsal and anal fins. From 46.5 mm SL brooding male (USNM 215313).

1.5–0.25 + 2.75–4.25 = 3.75–5.0 (see Tables 1–3 for additional counts). Proportional data, based on 27 specimens 26.0–55.0 ($\bar{x}$ = 45.7) mm SL, follow: HL in SL 7.2–10.2 (9.2), snout length in HL 2.6–3.3 (3.0), snout depth in snout length 1.8–3.0 (2.2), length of dorsal-fin base in HL 1.1–1.6 (1.3), pectoral-fin length in HL 3.7–5.9 (4.7), length of pectoral-fin base in pectoral-fin length 1.4–2.0 (1.7), anal ring depth in HL 2.2–3.3 (2.6), trunk depth in HL 1.9–2.8 (2.3). Distal half or more of tail with principal ridges flared laterad and with posterior angles of rings produced to form hook-like points (Fig. 1c); dermal flaps typically short (Fig. 6), often with frilled margins or with short distal branches.

Ground color pale to dark brown. Pale fish often with a brown lateral stripe on

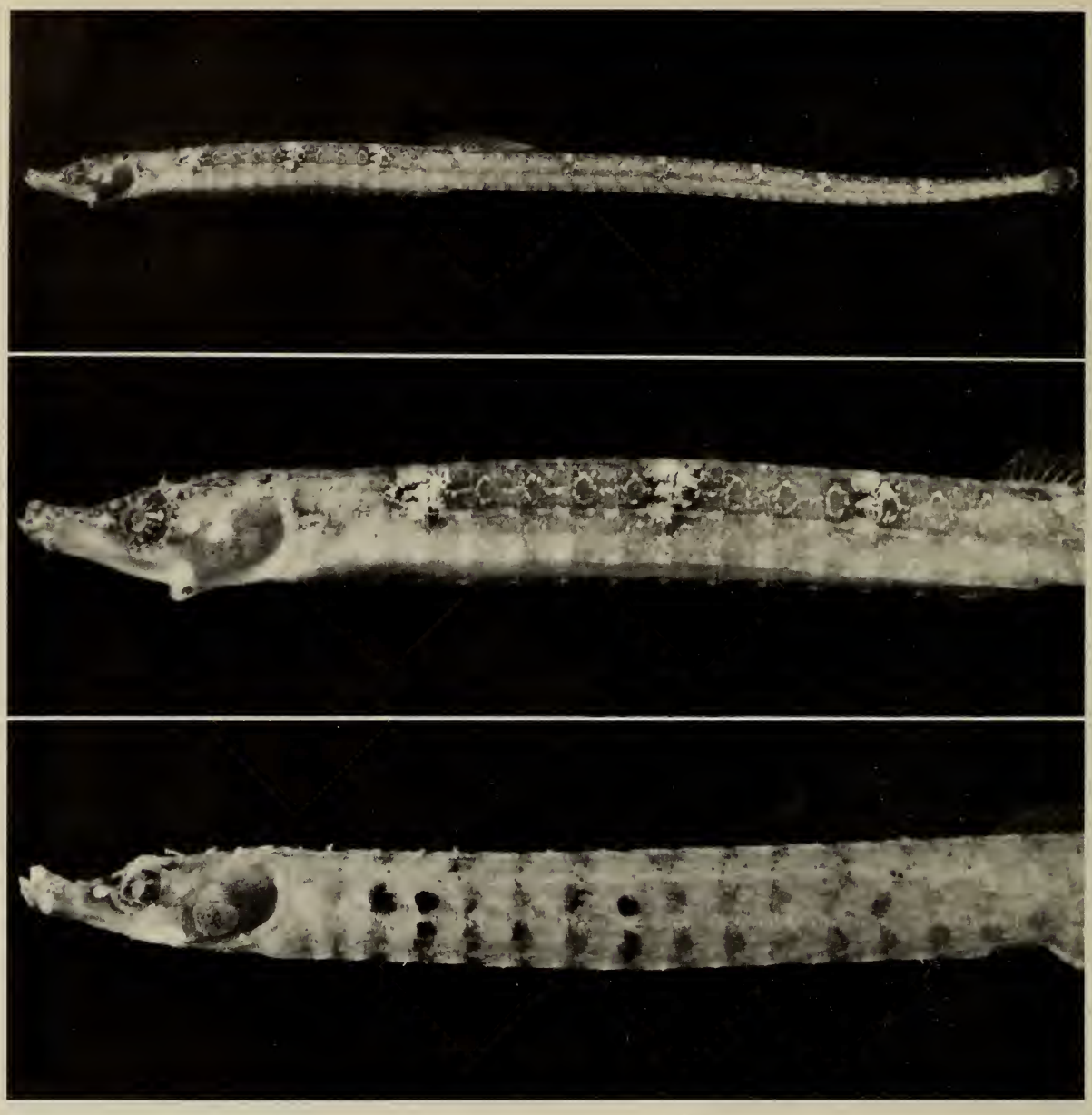

Fig. 7. *Micrognathus brevirostris pygmaeus*. Top and middle, USNM 217478 (42 mm SL, adult female). Bottom, AMS I.20770-004 (52 mm SL, male).

posterior half of snout which continues on postorbital and expands to encompass most or all of opercle; median portion of opercle usually with tan ocellus-like blotch, often narrowly margined with pale, and (in specimens >30 mm SL) usually with 1–20 discrete, minute, brown to near-black spots (Fig. 7); trunk and tail plain, with indications of narrow dusky bars on lower part of side and venter of trunk, or with similar bars encircling trunk; fins mainly hyaline. Dark specimens often with a narrow, transverse, pale bar below angle of gape; eye usually with dark bars radiating from pupil; sometimes with two pale bars below orbit; opercle much as described for pale fish; body usually with 10–11 irregular pale bars crossing dorsum and upper part of side; sometimes with near-black blotches on lateral ridge of 3rd–4th and 7th–8th trunk rings; lower part of side of trunk and venter of trunk and tail with well-defined or diffuse pale bars; brood-pouch folds may have narrow pale bars extending ventrad from middle of each pouch ring and narrow mottled edging along the free margins; fins usually flecked or shaded with brown.

Comparisons.—See this section under *M. b. brevirostris*.

Remarks.—Ogilby (1908) described *Corythoichthys spinicaudatus* from a single brooding male (57 mm TL) taken at Cape York in southern Queensland. He stated that the holotype was in the Queensland State Museum, but it was evidently never cataloged therein, it cannot now be located in any collection, and is apparently lost (R. J. McKay, pers. comm.). This specimen was described as having "all the caudal ridges strongly spinigerous throughout their length," 16 + 30 rings, 22 dorsal-fin rays, 14 pectoral-fin rays, 14 brood-pouch rings, and "dorsal fin inserted on 2 body and 3 caudal rings." The description is neither illustrated nor diagnostic and the identity of the holotype is uncertain. The population described here agrees with Ogilby's holotype in having "spinigerous" tail ridges and occurs in northern Queensland. On the other hand, Ogilby's meristic data best agree with those of *Micrognathus andersonii,* but specimens of this species seldom have tail ridges which could be termed "spinigerous" and *M. andersonii* is not known to occur near Cape York. Although Duncker (1915) and subsequent authors have referred Ogilby's name to the synonymy of *M. brevirostris* or listed it, without comment, as a subspecies thereof (Whitley and Allan 1958), *Corythoichthys spinicaudatus* is a nomen dubium.

Fritzsche (1981) described *Micrognathus pygmaeus* from two apparently faded or bleached specimens, including a brooding male (23 mm SL, holotype) and a presumed female paratype (20 mm SL), collected at Tahiti. The species was distinguished from *M. brevirostris* on the basis of fewer trunk rings (14 versus 15–17), a lower HL in SL ratio (7.1–7.4 versus 8.0–10.2), a higher snout length in HL ratio (3.2–3.4 versus 2.2–3.2) and its small size at maturity. I have examined these fish and find that both have 15 rather than 14 trunk rings and that the principal tail ridges are flared laterad (Fig. 1c). Although both specimens were described as having 1 + 4 subdorsal rings, the anterodorsal margin of the 1st tail ring is curved atypically anteriad in the paratype so that the subdorsal rings are 0 + 4 in dorsal aspect or 0.25 + 4 when viewed from the side. Since proportional and meristic values, as well as other morphological features, do not differ significantly from the population described here, I consider *pygmaeus* to be the first available name for the western Pacific subspecies of *M. brevirostris*.

The small size of the mature holotype is noteworthy, but two other small adult males are included in examined material. One (25 mm SL) from Bikini Atoll (USNM 141197), reported as *M. brevirostris* by Herald (1953), has pouch eggs through 10 of 12 pouch rings and retains traces of bars on the lower part of the trunk. The other (22 mm SL) is from the vicinity of Raine Is. (11°36′N, 144°01′E), N Queensland (AMS I.20757-001). This specimen has *ca.* 10 pouch eggs through 10 of 11 pouch rings, apparently 9 × 10 pectoral-fin rays (omitted from Tables), and there are dark spots, indicative of bars, on the lateral and inferior trunk ridges. Except for these specimens, the smallest male with evidence of a developing brood pouch and the smallest brooding male are both 39.5 mm SL. The pouch extends below 11–14 ($\bar{x}$ = 12.2) rings in 22 brooding males (39.5–55 mm SL), and the brood-pouch eggs are usually in a single layer of 2–4 transverse rows. A 49.5 mm SL fish has a total of 37 eggs distributed through the 10 anterior rings of a 12-ring pouch.

Dark spots are absent from the opercle of most small fish, but they are usually present on specimens larger than 30 mm SL and spots are usually more numerous on mature males. Among recently preserved fish (41–50 mm SL), there are 6–20

($\bar{x}$ = 12.8) spots on each opercle of 18 males and 0–12 ($\bar{x}$ = 4.8) on 23 presumed females.

Distribution.—*Micrognathus b. pygmaeus* is known from eastern Indonesia and northern Queensland to Bikini Atoll and Tahiti (Fig. 5). Occurrence at New Caledonia is based on the provisional identification of two bleached specimens. Available materials indicate that *M. b. pygmaeus* is replaced by *M. andersonii* in southern Queensland and that these species are sympatric within the region from Cape Melville (*ca.* 14°10′S) to the Endeavour Reef area (*ca.* 15°47′S). These species have occurred together in samples from Indonesia, as well as from Two Isles (*ca.* 15°01′S) and Little Hope Is. (*ca.* 15°47′S), Queensland. Among collections with adequate data, two are from "reef pools," five from 0–1.1 m, and seven from 1–8 m; maximum range for any collection is 0–20 m.

Material examined.—Seventy-eight specimens, 19–55 mm SL, including Holotype (USNM 207933, 23 mm SL, brooding male, Society Is., Tahiti, Taone, 1965), and Paratype (USNM 215775, 20, presumed female, data as for holotype). INDONESIA, Buru Is.: USNM 94084 (1, 45.5, paratype of *Syngnathus micronotopterus*). Ceram: USNM 215313 (1, 46.5). Banda Is.: ZMA 116.478 (1, 35). Irian Jaya: RMNH 27534 (1, 34). PAPUA NEW GUINEA: USNM 222933 (1, 39.5). PALAU IS.: CAS 47888 (1, 46), CAS 47891 (1, 49), CAS 47892 (1, 40.5), CAS 47896 (1, 47), CAS 47898 (1, 28.5), CAS 47903 (1, 47), CAS 47904 (1, 44). AUSTRALIA, Queensland: AMNH 35895 (1, 42), AMNH 35896 (3, 40–48), AMNH 35899 (4, 28–47.5), AMNH 35900 (3, 49–52), AMNH 35902 (1, 53), AMNH 35904 (4, 23–49), AMNH 35915 (1, 20.5), AMS I.14030 (1, 45.5), AMS I.18755-001 (1, 49.5), AMS I.19444-034 (2, 41–55), AMS I.19461-014 (4, 45.5–46), AMS I.19473-049 (3, 19–50), AMS I.19473-183 (1, 26), AMS I.20756-001 (1, 19), AMS I.20757-001 (1, 22), AMS I.20770-004 (4, 47–52), AMS I.20782-001 (1, 53), AMS I.21422-066 (1, 48.5), AMS I.21539-067 (1, 47.5), ANSP 119351 (3, 38.5–46), ANSP 148774 (2, 49–50.5), GCRL 17879 (5, 42–47), SIO 61-132 (2, 48–52). BISMARCK ARCH.: USNM 217478 (1, 42). SOLOMON IS.: CAS 19951 (1, 32.5), CAS-SU 25155 (1, 39.5), GCRL 13780 (1, 46), USNM 214140 (4, 39.5–45). SANTA CRUZ IS.: CAS 47899 (1, 39.5). NEW HEBRIDES IS.: CAS 19952 (1, 30.5). NEW CALEDONIA: USNM 215307 (2, 34–40.5). MARSHALL IS., Bikini Atoll: USNM 141197 (2, 25–25.7).

Micrognathus andersonii (Bleeker)
Figs. 8, 9

Syngnathus Andersonii Bleeker, 1858:465 [orig. descr.; Nova-selma, Kokos (Cocos) Is. (Indonesia)].

Corythroichthys tanakae Jordan and Starks, 1906:696, fig. 2 (orig. descr.; Tanegashima, Japan).

Diagnosis.—Trunk rings modally 16, principal ridges not angled laterad on distal half of tail, dorsal-fin rays usually 18–22, subdorsal tail rings usually 2.75–4.5, snout length averages 2.9 in HL, anal ring depth averages 2.4 in HL, often with prominent dark blotches above lateral trunk ridge.

Description.—Rings 15–17 + 27–32 (16–17 + 28–32 in 99%), dorsal-fin rays 17–24, pectoral-fin rays 11–13, anal-fin rays usually 3, subdorsal rings 1.75–0.25 +

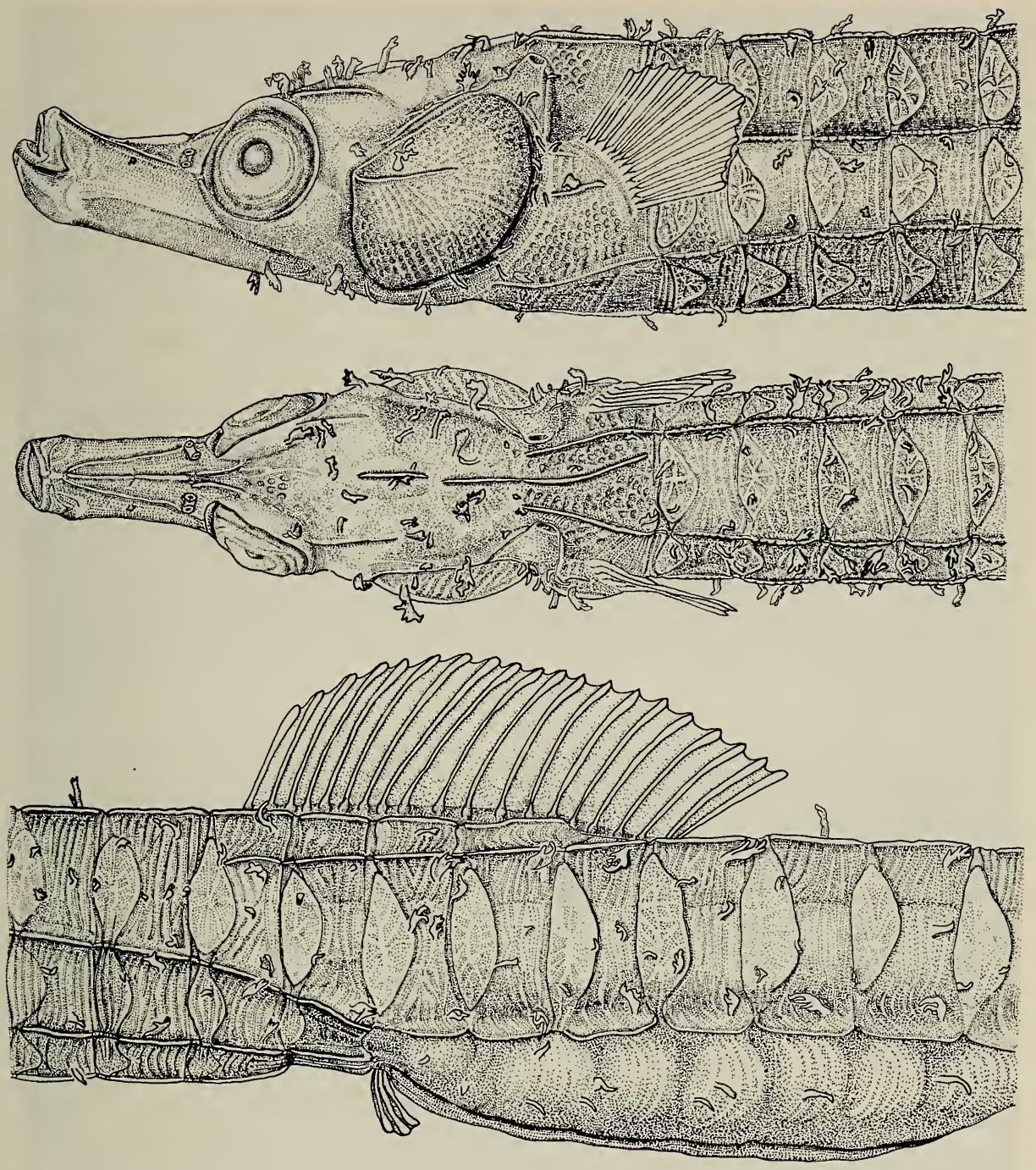

Fig. 8. *Micrognathus andersonii*. Lateral and dorsal aspects of head and anterior trunk rings, together with section of body illustrating ridge configuration and dorsal and anal fins. From 57 mm SL brooding male (HUJ F.8034).

2.5–5.0 = 3.75–5.75 (see Tables 1–3 for additional counts). Proportional data, based on 56 specimens 37.5–75.0 ($\bar{x}$ = 53.2) mm SL, follow: HL in SL 8.1–10.4 (9.0), snout length in HL 2.7–3.4 (2.9), snout depth in snout length 1.6–2.8 (2.1), length of dorsal-fin base in HL 0.9–1.5 (1.2), pectoral-fin length in HL 2.8–5.3 (4.0), length of pectoral-fin base in pectoral-fin length 1.3–2.4 (1.7), anal ring depth in HL 1.9–3.1 (2.4), trunk depth in HL 1.7–2.8 (2.0). Principal tail ridges essentially straight (Fig. 1a), infrequently elevated slightly and with pointed posterior angles (Fig. 1b) but not clearly angled or flared laterad with enlarged hook-like

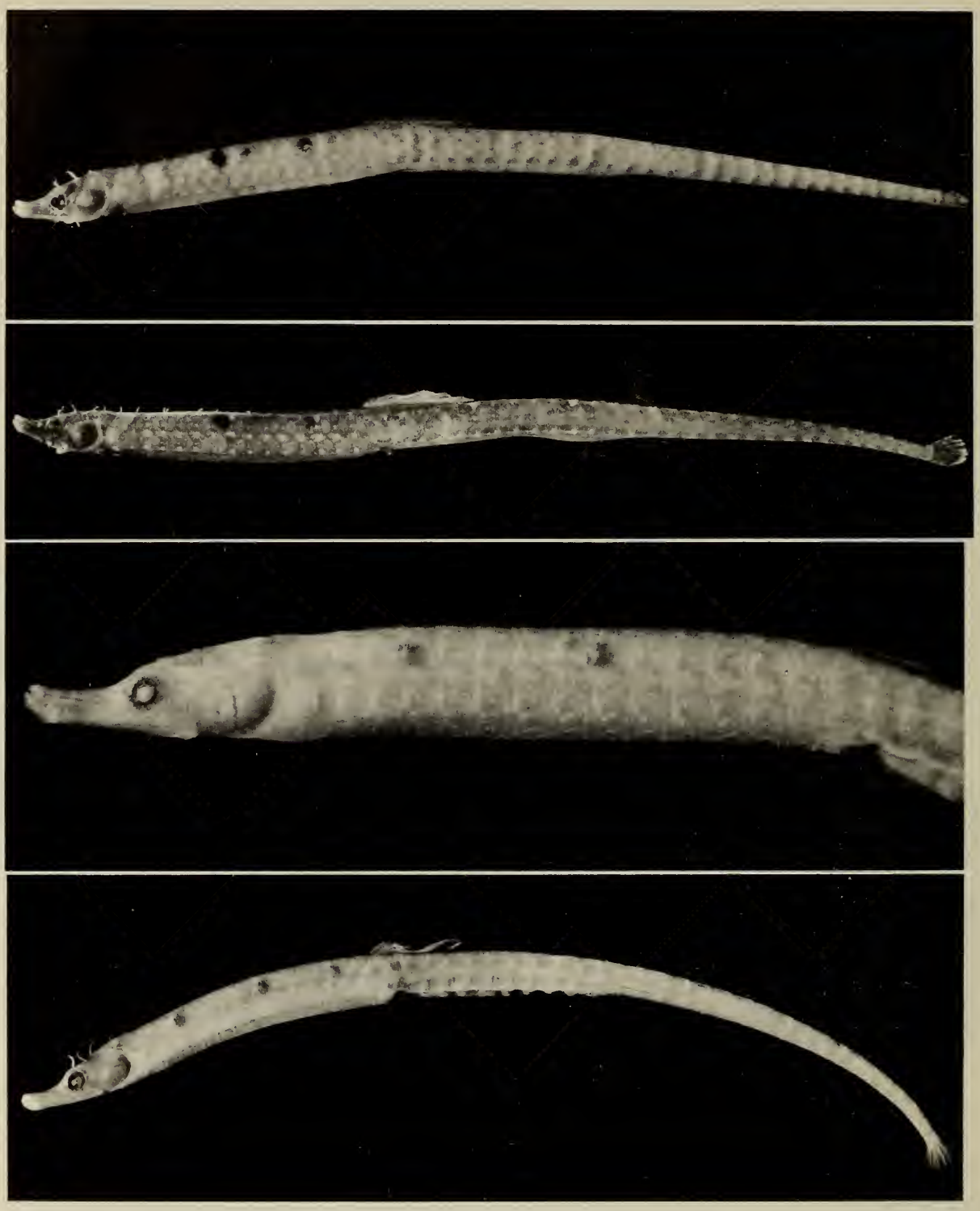

Fig. 9. Upper pair, *Micrognathus andersonii,* GCRL 17020: Top, 64 mm SL, male, pale coloration; Bottom, 72 mm SL, male, dark coloration. Lower pair, *M. micronotopterus*: Top, USNM 94082 (55 mm SL, brooding male, holotype); Bottom, CAS-SU 30916 (55 mm SL, male).

posterior angles (Fig. 1c). Dermal flaps usually short (Fig. 8), simple, with frilled margins or with short branches distally.

Ground color pale to dark brown (Fig. 9); variously plain, mottled or blotched and spotted with pale or brown; eye usually with dark bars radiating from pupil; often with 1–3 pale or brown bars below eye; opercle usually plain, sometimes with a pale blotch or bar but without discrete dark spots; body often with 9–13

narrow bars crossing dorsum and part of side from nape to caudal-fin base; with or without 1–4 dark blotches between lateral and superior trunk ridges; typically without bars crossing lower half of trunk; dorsal and pectoral fins hyaline or with fin-rays and membrane streaked or flecked with brown; caudal fin usually brownish with pale distal margin.

Comparisons.—The combination of modally 16 trunk rings, usually 18–22 dorsal-fin rays, short snout and essentially straight tail ridges distinguishes *M. andersonii* from congeners. In addition, adult males of *M. andersonii* tend to have more brood-pouch rings than males of Indo-Pacific congeners (13–18 versus 10–15). Infrequent specimens with atypical counts of 15 trunk rings are distinguished from *M. micronotopterus* and *M. natans,* species sharing a count of 15 trunk rings and essentially straight tail ridges, by a lower average snout depth in snout length ratio (2.1 versus 2.6–3.4), a lower average length of dorsal-fin base in HL ratio (1.2 versus 1.6–1.7) and other features (see descriptions). Specimens of *M. andersonii* and *M. micronotopterus* may have prominent dark blotches above the lateral trunk ridge and these sympatric species cannot be distinguished solely on the basis of preserved coloration. Small specimens of *M. andersonii* (*ca.* 12–20 mm SL) are best distinguished from those of Indo-Pacific congeners by their typically higher frequency of trunk rings (usually 16–17 versus 14–15) and other meristic differences (see Tables 1–3).

Remarks.—Although clearly representing a separate taxon, this species was referred to the synonymy of *M. brevirostris* by Weber (1913) and it has been so treated by subsequent authors.

Bleeker's (1858) unillustrated original description of *Syngnathus andersonii,* based on a single male specimen, gives counts of 16 + 27 or 28 rings, 1 + 4 subdorsal rings, 19 or 20 dorsal-fin rays, 14 pectoral-fin rays, 3 or 4 anal-fin rays, 10 caudal-fin rays and 14 or 15 pouch rings. The holotype (RMNH 7227), now 47 mm SL, has 20 or 21 rays in the damaged dorsal fin, 10 caudal-fin rays, 16 + 28 rings, 0.75 + 4.25 subdorsal rings, 15 pouch rings and some dermal flaps persist on the head. Both pectoral fins are damaged but Bleeker's count of 14 fin-rays is probably in error, since the number is 11–13 in fins examined here (Table 2). Aspects of the history of the holotype were discussed by Dawson (1977) but there is little doubt that this specimen, now faded and pencil-marked, was the model for Bleeker's unpublished Atlas illustration of this species (Pl. 450, fig. 3).

Syngnathus sundaicus, described from Java by Bleeker (1853) and referred to the synonymy of *Micrognathus brevirostris* by Duncker (1915), may have been based on an Indonesian species of *Micrognathus* (*andersonii, micronotopterus,* or *b. pygmaeus*) but the name must be considered a nomen dubium. The unfigured original description, based on a van Hasselt drawing which has since been lost, is not diagnostic and the name cannot be referred with certainty to any genus or species of pipefish.

Jordan and Starks (1906) based their description of *Corythroichthys tanakae* on eight specimens (including 5 males) and stated that the "type" was numbered USNM 53271 and that a "cotype" was numbered SU 9358. Springer and Eschmeyer (1974) have shown that these numbers were apparently transposed and that the holotype is presently numbered CAS-SU 9358. This species was referred to the synonymy of *Micrognathus brevirostris* by Duncker (1915) and it has been so treated by most subsequent authors. Although I have no information on the

fate of four of the eight original specimens, I find the holotype and three presumed paratypes (USNM 53271), including two males and a female, to be conspecific with *M. andersonii*.

The smallest examined male with evidence of a developing brood pouch is 33.5 mm SL and the smallest brooding fish is 34 mm SL. The brood pouch extends below 13–18 ($\bar{x}$ = 15.4) tail rings in 70 brooding males (34–70.5 mm SL) and the brood-pouch eggs are usually deposited in one layer of 2–7 transverse rows. A 58.5 mm male has a total of 95 eggs deposited through the anterior 13 rings of a 14-ring pouch, and a 67.5 mm fish has 103 eggs through 14 of 15 pouch rings. Dermal flaps are usually short (Fig. 8) and often have frilled margins or short distal branches. Infrequent samples include occasional subadult-adults with longer flaps which are somewhat similar to those of *M. micronotopterus*. Preserved coloration is highly variable and both pale and dark fish, without regard to size or sex, may occur in the same collection. Some young fish (15.5–16 mm SL) from inshore plankton collections (GCRL 16873, 17452) have dermal flaps on the body and the adult pattern of bars on the dorsum.

Present materials show little geographic variation in meristic values but some differences are noteworthy. Numbers of tail rings are lowest (27–30) in fish from the Philippines and the Palau Is. and highest (29–32) in specimens from Australia and the Ryukyu Is. Similarly, Philippine fish have the lowest numbers of dorsal-fin rays (17–21) and highest numbers (19–24) occur in specimens from the Ryukyu Is. Pectoral-fin rays are most often 11 (58% of 142 counts) in fish from the Red Sea and western Indian Ocean but usually 12–13 (92% of 388) in other material. In addition to having low numbers of tail rings and dorsal-fin rays, examined Philippine specimens do not exceed 45 mm SL and brooding males are smaller than those from other areas (34–45 versus 41–70 mm or longer). Despite these differences, I find no basis for separate taxonomic treatment of the Philippine population.

Two fish with atypical meristic values (not in Tables) are provisionally referred to *M. andersonii*. A bleached female (65 mm SL) from New Caledonia with somewhat flared tail ridges and without persistent dermal flaps seems to best agree with this species, but there are 14 rays in each pectoral fin, 17 dorsal-fin rays and 15 + 29 rings. The condition of the specimen, coupled with high numbers of pectoral-fin rays and low numbers of trunk rings and dorsal-fin rays prevents positive identification. The second questionable fish is an early juvenile (*ca.* 12 mm SL) taken with a specimen of *M. andersonii* (14 mm SL) by the ALBATROSS at Ticao Is., Philippine Is. (USNM 133054). Presence of 15 + 29 rings would indicate that this is an example of *M. micronotopterus*, but counts of 20 dorsal-fin rays and 1.25 + 3.75 subdorsal rings are high for that species (see Tables 1–3) and suggest that this specimen is best referred to *M. andersonii*.

Distribution.—Micrognathus andersonii is known from the Red Sea (Gulfs of Suez and Aqaba to the Dahlak Arch.) and western Indian Ocean to Japan (Honshu Is.) and southeastward to Samoa and the Tonga Is. (Fig. 10). Examined Indian Ocean material confirms the occurrence of this species on the African coast from Kenya to South Africa (*ca.* 32°10′S) and there are specimens from Madagascar, the southeastern tip of India and western Indonesia. There are no specimens of any species of *Micrognathus* in numerous collections examined from Aldabra and the Comoro Is., the Seychelles and Amirante Is., St. Brandon (Cargados Carajos)

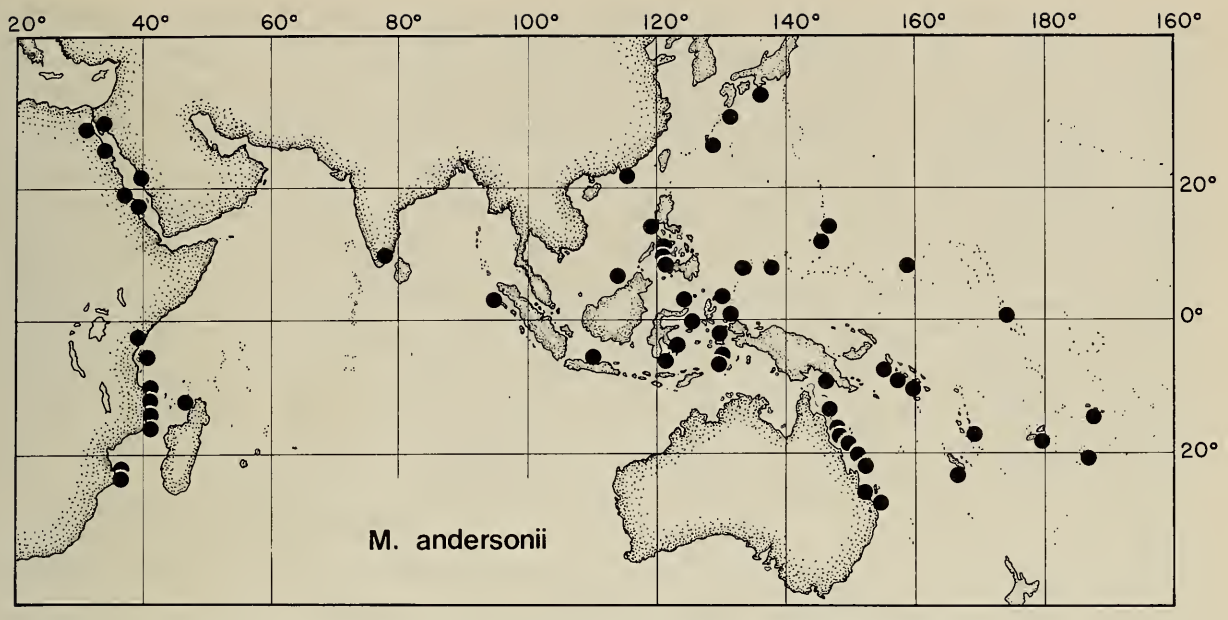

Fig. 10. Distribution of *Micrognathus andersonii* based on material examined.

Shoal, Mauritius, the Maldive Is., Chagos Archipelago, Sri Lanka, and the Cocos-Keeling Is. Records of *M. brevirostris* from Aldabra and the Seychelles (Smith 1955, 1963; Smith and Smith 1963) are not supported by material in collections, and are, at least in part, based on misidentified specimens of a superficially similar pipefish, *Phoxocampus belcheri* (Kaup). A listing by Marshall (1950) is based on the misidentification of the type-locality as Cocos-Keeling rather than the Cocos Is. of Indonesia. These observations indicate the absence or a low level of abundance of *M. andersonii* and other species of *Micrognathus* at these Indian Ocean localities. In Australia, *M. andersonii* is known only from the vicinity of Cape Melville (*ca.* 14°12′S) and southward along the Queensland coast to the vicinity of Southport (*ca.* 27°58′S). This species is sympatric with *M. b. brevirostris* in the Red Sea, with *M. micronotopterus* in Indonesia and the Philippine Is., and with *M. b. pygmaeus* on the Queensland coast of Australia (*ca.* 14–16°S), as well as at a number of other western Pacific localities from Indonesia to Palau and southeastward to the New Hebrides and New Caledonia. Thirty samples with useful data indicate collections of juveniles-adults in rock or reef tidepools, among "turtle grass" and seaweed, and on reef and sand flats. Maximum recorded depth range is 0–5.2 m, but 29 of these samples are from 0–2 m. Planktonic young have been taken in the upper 0–100 m over depths to 4825 m.

Material examined.—Five hundred eighty-three specimens, 12–78 mm SL, including the holotype (RMNH 7227, 47.0, male, Nova-selma, Kokos (Cocos) Is., Indonesia). RED SEA, Gulf of Suez: BMNH 1925.9.19.35 (2, 39–54.5), BMNH 1925.9.19.36 (1, 56.5), BMNH 1925.12.31.21 (1, 65.5), HUJ F.2104 (1, 65), HUJ F.8034 (3, 49–62), HUJ F.9243 (1, 59.5), TAU P.5653 (3, 51.5–63.5), ZMB 31293 (1, 54). Gulf of Aqaba: BMNH 1960.3.15.99 (1, 50.5), GCRL 13880 (3, 54.5–57), HUJ F.4748 (3, 48–56.5), HUJ F.8032 (2, 50.5–58.5), HUJ F.8033 (18, 44–59.5), HUJ F.9244 (1, 39.5), TAU P.3560 (1, 35), TAU P.6264 (1, 39.5), TAU P.6266 (1, 32.5). Quseir (Koseir): MCZ 3814 (3, 54.5–55), ZMB 7906 (1, 55). Suakin: BMNH 1886.6.9.27 (7, 24.5–65.5). Dahlak Arch.: HUJ F.9245 (2, 33.5–35). Jid-

dah: RMNH 18391 (2, 58.5–63.5), RMNH 18392 (2, 43–48.5). Loc. uncertain: HUJ F.8028 (1, 59.5), HUJ F.8031 (1, 54), HUJ F.9246 (1, 21.5), MNHN 93-64 (1, 52.5), TAU P.3557 (2, 36.5–56.5). INDIAN OCEAN, Kenya: RUSI 4664 (1, 27.5), RUSI 15029 (1, 41), RUSI 15037 (3, 14–60.5), RUSI 15040 (1, 44). Zanzibar: MCZ 36592 (1, 48), RUSI 4109 (1, 47), RUSI 15030 (7, 43.5–62). Mozambique: RUSI 4100 (1, 57.5), RUSI 4108 (1, 33.5), RUSI 12241 (1, 70.5), RUSI 12242 (1, 50.5), RUSI 12244 (1, 45), RUSI 15031 (1, 46.5), RUSI 15032 (1, 51.5), RUSI 15033 (3, 44–64), RUSI 15034 (4, 41–57), RUSI 15035 (12, 35–67.5), RUSI 15036 (2, 57.5–61), RUSI 15041 (3, 52–64), RUSI 15042 (6, 33–61), SAM 28989 (1, 36.5). South Africa: RUSI 15038 (30, 32.5–65), RUSI 15043 (10, 15–59). Madagascar, Nosi Bé: MNHN 31:263 (1, 43.5), USNM 214141 (1, 38). India, Musaltiva Is.: FMNH 75853 (1, 46.5). Loc. uncertain: MNHN 4956 (1, 63), RUSI 12275 (9, 32.5–50.5). PACIFIC OCEAN, Indonesia: BMNH 1867.11.28.355 (1, 58), BMNH 1880.7.12.7-10 (4, 46–52.5), RMNH 21106 (1, 37), USNM 94083 (1, 48.5) and USNM 94086 (1, 43), paratypes of *Syngnathus micronotopterus*, USNM 210654 (1, 52), USNM 215287 (1, 36), ZMA 115.977 (1, 43.5), ZMA 115.978 (2, 38.5–44), ZMA 115.979 (1, 22), ZMA 115.981 (1, 71.5), ZMA 116.039 (2, 31.5–35), ZMUC P.39598 (1, 16.5). Hong Kong: CAS 47902 (2, 44–49). Philippine Is.: CAS 47886 (1, 33.5), CAS-SU 29952 (1, 33.5), CAS-SU 39164 (1, 40), CAS-SU 51498 (5, 36–45), GCRL 16999 (1, 15.6), USNM 94087 (40, paratype of *S. micronotopterus*), USNM 133054 (2, 12–14), USNM 219514 (23, 24.5–42.5), USNM 220656 (1, 32), UWCF 20835 (1, 39.5), UWCF 20836 (1, 36.5), ZMUC P.39596 (1, 15), ZMUC P.39597 (1, 12.5). Ryukyu Is.: CAS-SU 9358 (68, male, holotype of *Corythroichthys tanakae*), CAS-SU 9782 (13, 35–75), FMNH 42866 (1, 62.5), USNM 53271 (3, 56–60, presumed paratypes of *C. tanakae*), USNM 70741 (78, 31.5–72), USNM 172063 (1, 60.5), YCM P.1471 (2, 28.5–57), YCM P.1765 (1, 51), YCM P.2859 (1, 33.5), YCM P.6007 (1, 28.5), YCM P.6010 (4, 40–52.5), YCM uncat. (1, 63). Japan, Honshu Is.: YCM P.7981 (1, 71). Palau Is.: BPBM 9596 (4, 48–60.5), CAS 34089 (1, 49.5), CAS 47887 (1, 32.5), CAS 47889 (2, 28–28.5), CAS 47890 (1, 40.5), CAS 47893 (1, 45.5), CAS 47894 (3, 38–45), CAS 47895 (1, 28), CAS 47897 (1, 51.5), CAS 47905 (1, 24). Mariana Is.: AMNH 27006 (1, 27), ANSP 80661 (1, 45), ANSP 90783 (1, 49.5), CAS 34088 (1, 22.5), CAS 47885 (1, 22.5), CAS 47900 (1, 43.5), CAS 47901 (1, 41), FMNH 42864 (1, 24), FMNH 42865 (1, 51.5), UG 1556 (1, 43), UG 6260 (1, 45.5), UMMZ 197958 (1, 40.5), UMMZ 197992 (1, 31.5), UMMZ 198004 (2, 49–53.5), UMMZ 198224 (1, 42), USNM 109382 (1, damaged), USNM 154631 (6, 40–47.5). Papua New Guinea: KFRS F.2956 (1, 36). Australia, Queensland: AMNH 35897 (1, 51), AMNH 35903 (7, 33.5–65), AMNH 43098 (1, 65), AMS I.2962 (4, 30–55.5), AMS I.6214-5 (2, 57–63.5), AMS I.11429 (5, 50.5–57), AMS I.12972 (1, 55.5), AMS I.18784-001 (3, 57.5–58), AMS I.19477-066 (1, 42.5), AMS I.20200-021 (3, 54–67), AMS I.20207-010 (2, 47.5–51.5), AMS I.20463-041 (2, 60.5–61), AMS 20760-001 (1, 75), AMS I.20761-001 (1, 53.5), AMS I.20772-003 (3, 54–61), AMS I.20773-006 (1, 38.5), AMS I.20780-004 (7, 46–62.5), AMS I.20787-006 (1, 33.5), AMS I.22851 (2, 40.5–43), AMS I.21538-022 (1, 55), AMS IA.229 (7, 46.5–61.5), AMS IA.1807 (1, 58.5), AMS IA.2624 (8, 22.5–60), AMS IA.4821 (1, 70.5), AMS IA.4822 (1, 78), AMS IA.5645 (1, 49), AMS IA.7066 (1, 65), AMS IA.7364-65 (11, 45.5–69.5), AMS IB.6580 (2, 54–56), AMS IB.6686 (1, 57.5), ANSP 113480 (9, 50–72.5), BMNH 1873.4.3.76-77 (1, damaged), BMNH 1933.1.25.11 (1, 70), BMNH 1933.1.25.12-13 (2, 56–58), BPBM 14344 (1, 39), CAS

13784 (4, 62.5–64), CAS 13789 (1, 67.5), CSIRO B.1366 (6, 50.5–58), GCRL 15533 (1, 59.5), GCRL 16122 (1, 68), GCRL 16300 (2, 51–56), GCRL 16873 (1, 16), GCRL 17020 (5, 45–72.5), GCRL 17451 (1, 43), GCRL 17452 (1, 15.5), MCZ 36896 (1, 58), QM I.2050 (1, 50), QM I.6585 (1, 53), QM I.9318 (11, 35–68), QM I.9381 (7, 41–56), SIO 61-132 (7, 48–56), USNM 177141 (1, 47.5), USNM 231699 (5, 51.5–61), USNM 231700 (2, 51.5–56.5), USNM 231701 (2, 44–53), WAM P.26499-001 (1, 41.5). Ponape: USNM 223108 (1, 37). Solomon Is.: BPBM 15678 (1, 36.5), CAS 20025 (1, 44). New Hebrides: AMS I.6364 (1, 36), AMS IA.772 (1, 32.5), GCRL 13781 (2, 46.5–50), USNM 214139 (3, 34–41). New Caledonia: AMS I.18446-001 (1, 49), CAS 19946 (3, 36–39), CAS 19953 (14, 42–58), CAS 19954 (2, 49–52), CAS 20027 (3, 45–55.5), MNHN 9297 (1, 65). Gilbert Is. (Tarawa): AMS I.18054-008 (1, 51). Fiji Is.: CAS-SU 24863 (1, 43). Samoa Is.: GCRL 16290 (2, 37.5–46). Tonga Is.: USNM 83004 (1, damaged). Loc. uncertain: MNHN A.477 (1, 65), "Poulo Condor" (Indochina).

Micrognathus micronotopterus (Fowler)
Figs. 9, 11

Syngnathus micronotopterus Fowler, 1938:42, fig. 14 (in part, orig. descr.; Canimo Is., S Luzon, Philippine Is.).

Diagnosis.—Trunk rings modally 15, principal ridges not angled laterad on distal half of tail, dorsal-fin rays usually 17–18, subdorsal tail rings usually 2.25–3.5, snout length averages 2.6 in HL, anal ring depth averages 2.8 in HL, often with prominent dark blotches above lateral trunk ridge.

Description.—Rings 15 + 28–31, dorsal-fin rays 17–19, pectoral-fin rays 10–13 (usually 11–12), anal-fin rays usually 3, subdorsal rings 1.5–0.25 + 2.25–3.75 = 3.25–4.5 (see Tables 1–3 for additional counts). Proportional data, based on 19 specimens 28.0–57.0 ($\bar{x}$ = 47.3) mm SL, follow: HL in SL 7.2–8.9 (8.3), snout length in HL 2.3–3.0 (2.6), snout depth in snout length 2.1–3.1 (2.6), length of dorsal-fin base in HL 1.3–1.9 (1.6), pectoral-fin length in HL 3.9–5.6 (4.9), length of pectoral-fin base in pectoral-fin length 1.4–2.1 (1.7), anal ring depth in HL 2.5–3.2 (2.8), trunk depth in HL 2.1–2.9 (2.4). Principal tail ridges essentially straight (Fig. 1a), infrequently elevated slightly (Fig. 1b), not angled or flared laterad with posterior angles of rings produced to prominent hook-like points. Dermal flaps on head of adults mostly long, slender and unbranched (Fig. 11).

Ground color tan to dark brown, usually mottled; usually with 10–12 narrow, diffuse, pale bars crossing dorsum between nape and caudal-fin base; sometimes with indications of subequal dark and pale bars on lower half of trunk; tan to light brown fish usually with 1–6 diffuse dark blotches between lateral and superior trunk ridges; dorsal fin often plain, sometimes with 2–3 irregular brownish stripes crossing fin-rays and membrane; pectoral fin often barred or shaded with brown; caudal fin brownish with pale distal margin.

Comparisons.—The combination of modally 15 trunk rings, usually 17–18 dorsal-fin rays, relatively long snout and essentially straight tail ridges distinguishes subadult-adult specimens of *M. micronotopterus* from congeners. Furthermore, the dermal flaps on the dorsum of head of adults (Fig. 11) are typically long and simple, whereas those of adult congeners are typically shorter and often frilled or with short branches distally. Occasional adult specimens of *M. andersonii* or

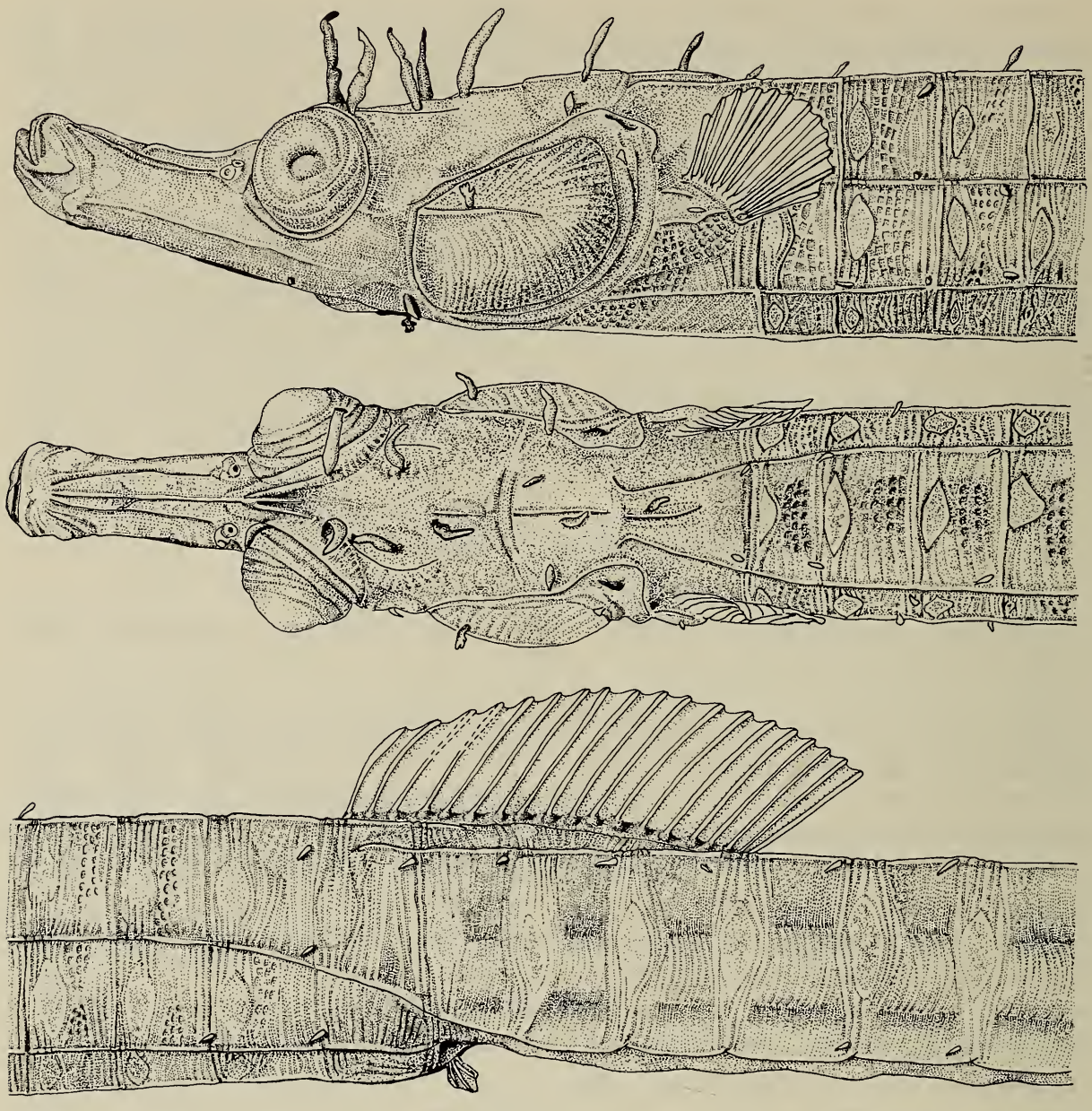

Fig. 11. *Micrognathus micronotopterus*. Lateral and dorsal aspects of head and anterior trunk rings, together with section of body illustrating ridge configuration and dorsal and anal fins. From 55 mm SL male (CAS-SU 30916).

M. natans with atypical counts of 15 trunk rings could be confused with *M. micronotopterus,* but these can usually be distinguished without undue difficulty. The HL in SL ratio of *M. micronotopterus* averages somewhat less than that of *M. andersonii* (8.3 versus 9.0), the snout is more slender (snout depth in snout length averages 2.6 versus 2.1) and specimens of *M. andersonii* seldom have long head flaps (usually present in adult *micronotopterus*). In areas of sympatry, small specimens of *M. micronotopterus* (< *ca.* 20 mm SL) are best distinguished from juvenile *M. andersonii* by the number of trunk rings (modally, 15 versus 16 in *andersonii*). Compared to *M. natans,* specimens of *M. micronotopterus* have a lower average snout depth in snout length ratio (2.6 versus 3.4), a deeper body (anal ring depth in HL averages 2.8 versus 4.8), fewer subdorsal tail rings (2.25–

3.75 versus 3.5–5.0) and often have dark blotches on the side of the trunk (absent in *natans*).

Remarks.—Fowler's (1938) description was based on the holotype (USNM 94082) from the Philippine Is. and "a series of paratypes from the Philippines and the East Indies." Of the six fish now catalogued as paratypes of *M. micronotopterus,* two (USNM 94085, 99007) are conspecific with the holotype, one (USNM 94084) is a specimen of *M. b. pygmaeus,* and three (USNM 94083, 94086, 94087) are representatives of *M. andersonii.* The holotype (Fig. 9) is a brooding male with 11 pouch rings, long simple flaps on the supraorbital, frontal and nuchal ridges, persistent lateral blotches on the 4th, 9th and 13th trunk rings, and the following measurements (mm): SL 55.5, HL 6.7, snout length 2.7, snout depth 0.9, length of dorsal-fin base 3.8, pectoral-fin length 1.3, length of pectoral-fin base 0.6, anal ring depth 2.6, trunk depth 3.0 (see Tables 1–3 for additional data). Herald and Randall (1972) identified "the two type specimens" of *Ichthyocampus annulatus* Macleay as *Micrognathus brevirostris* and suggested that the figure (Macleay, 1878, pl. 10, fig. 6) accompanying the original description (=*Yozia bicoarctata*) was published in error. The two fish mentioned by Herald and Randall (AMS I.16288-001, formerly Macleay Mus. F.262) and a third "syntype" (AMS IA.1556) are conspecific with *Micrognathus micronotopterus.* I find no direct evidence that Macleay identified these specimens as *Ichthyocampus annulatus,* and the original description (Macleay, 1878) does not fully agree with these "syntypes" or with the figured specimen. However, except for numbers of rings and dorsal-fin rays, the description agrees closely with the figure and with the data from some 50 specimens of *Yozia bicoarctata.* In cases where a figured description differs strikingly from the presumed type material, I believe that the name must be applied to the illustrated taxon. Therefore, I consider *Ichthyocampus annulatus* a junior synonym of *Yozia bicoarctata* (Bleeker) rather than a senior synonym of *Micrognathus micronotopterus.*

The smallest examined male with evidence of a developing brood pouch is 28 mm SL, and the smallest brooding fish is 31.5 mm SL. The brood pouch is developed below 11–15 ($\bar{x}$ = 12.7) tail rings in 10 brooding males (42–56 mm SL), and the brood-pouch eggs are usually deposited in one layer of 2–4 transverse rows. A 47 mm SL male has a total of 16 eggs in two rows through 8 rings of an 11-ring pouch, whereas a 56 mm SL fish has *ca.* 92 eggs deposited in 4 rows through 11 of the 13 pouch rings. Specimens faded in preservative, or those with very dark ground color, may lack dark blotches above the lateral trunk ridge, but others may have 1–6 blotches on each side of the trunk; sixteen examined specimens have three lateral blotches located on the 4th–5th, 8th–10th, and 12th–14th trunk rings.

Two small fish, 20.5–23 mm SL (USNM 231698), provisionally referred to *M. micronotopterus,* have 15 trunk rings, 4.25–4.5 subdorsal rings, and were taken with 23 specimens of *M. andersonii* (24.5–42.5 mm SL).

Distribution.—Micrognathus micronotopterus is known from Singapore, western Indonesia, the Philippine Is. and Australia (Fig. 5); a specimen labelled "Cochinchina" (MNHN 84-897) is of uncertain origin. In Australia, this is the only species of *Micrognathus* known to occur on the northwestern coast from the Exmouth Gulf, Western Australia (*ca.* 114°22′E) to the vicinity of Yirrkala

Mission, Northern Territory (*ca.* 136°53′E). Data from 8 samples indicate occurrence in tidepool and coral reef habitats to depths of 1.5–5.5 m. This species is sympatric with *M. andersonii* in Indonesia and the Philippine Is., but it does not seem to occur with *M. b. pygmaeus* in either Indonesia or Australia.

Material examined.—Thirty-eight specimens, 20.5–57 mm SL, including holotype and two paratypes.

Holotype (USNM 94082, 55.5 mm, brooding male, Philippine Is., SE Luzon Is. [W entrance to San Miguel Bay], Canimo Is., Daet Pt., 15 June 1909, ALBATROSS). Paratypes (USNM 94085, Philippine Is.: 1, 31.5, male, Cebu Is., reef opposite Cebu, 7 Apr. 1908, ALBATROSS; USNM 99007, 1, 51.5, female, taken with holotype). SINGAPORE: BMNH 1952.12.16.11 (1, 47), CAS-SU 30916 (8, 44.5–57), FMNH 46923 (1, 56), GCRL 17945 (1, 55). INDONESIA, Java: RMNH 27592 (1, 47.5), UMMZ 183301 (1, 47), USNM 215316 (1, 53). Brunei: RMNH 12424 (2, 53–56). PHILIPPINE IS., Negros Is.: USNM 231698 (2, 20.5–23). AUSTRALIA, Western Australia: AMS I.17060-047 (4, 36–38), GCRL 18310 (1, 35.5), QM I.16658 (1, 40), WAM P.20069 (1, 45.5). Northern Territory: AMS IA.1556 (1, *ca.* 46.5) and AMS I.16288-001 (2, *ca.* 46–47.5), "syntypes" of *Ichthyocampus annulatus*. GCRL 16952 (1, 28), NTM S.10006-031 (1, 38), USNM 173071 (1, 44.5), USNM 173072 (1, 43.5), USNM 222931 (1, 30.5), USNM 222932 (1, 29.5). Loc. uncertain: MNHN 84-897 (1, 45.5), Cochinchina.

Micrognathus natans, new species
Figs. 12, 13

Holotype.—AMS I.20390-012 (36 mm SL, immature male), Fiji Is., Beqa Is., probably taken at surface with dipnet and light, 14 Jan. 1974, B. Goldman and B. Carlson.

Paratypes.—PHILIPPINE IS.: USNM 133055 (1, 33.5), S Luzon Is., Varadero Hbr., 22 July 1908, *Albatross*. USNM 230674 (1, 33.5), S Luzon Is., Varadero Bay, 20–23 July 1908, *Albatross*. USNM 230673 (1, 33.5), SE Mindoro Is., Mansalay, 3 June 1908, *Albatross*. ZMUC P.39700 (1, 26), 13°32′N, 121°21′E, in 0–100 m over 450 m, 26 June 1929, *Dana* Sta. 3733, III. ZMUC P.39701 (1, 30) and ZMUC P.39702 (1, 28), 11°43′N, 121°43′E, in 0–200 m over 1170 m, 27 June 1929, *Dana* Sta. 3734, II and III. AUSTRALIA, Qld.: AMS I.20951-007 (1, 26), Cape York, E of Bligh Reef, 12°42′S, 144°05′E, neuston tow in 0–1 m over +900 m, Sta. FNQ 79-82, 22 Feb. 1979, AMS-AIMS pty. AMS I.20909-001 (1, 36) and GCRL 18237 (1, 45), Lizard Is. area, 16.7 km E of Carter Reef, 14°30′S, 145°52′E, neuston tow in 0–1 m over +900 m, Sta. FNQ 79-14, 7 Feb. 1979, J. Leis and B. Hartwick. AMS I.21760-001 (7, 34.5–45) and GCRL 18238 (5, 34.5–42.5), 11.1–16.7 km E of Carter Reef, 14°30′S, 145°42′E, neuston tow in 0–1 m over +900 m, Sta. FNQ 79-113, 7 Feb. 1979, AMS-AIMS pty. AMS I.21761-001 (1, 37.5), Sta. FNQ 79-114, data as for 79-113. AMS I.22540-001 (1, 37.5), Lizard Is., midway to outer barrier, 14°32′S, 145°34′E, 0–18 m, Sta. FNQ 79-7, 7 Feb. 1979, AMS-AIMS pty. NEW CALEDONIA: AMS I.19762-039 (1, 34.5), *ca.* 71.4 km offshore, 22°03′S, 167°44′E, midwater trawl in 0–800 m over 2300 m, 13 May 1971, J. Paxton. ZMUC P.39668-677 (10, 18.5–35.5), ZMUC P.39678-699 (22, 13–30), GCRL 18136 (4, 20–31) and GCRL 18137 (7, 19–32), 20°53′12″S, 164°03′18″E, in 0–50 m over 3490 m, 26 Nov. 1929, *Dana* Sta. 3611, V and VI.

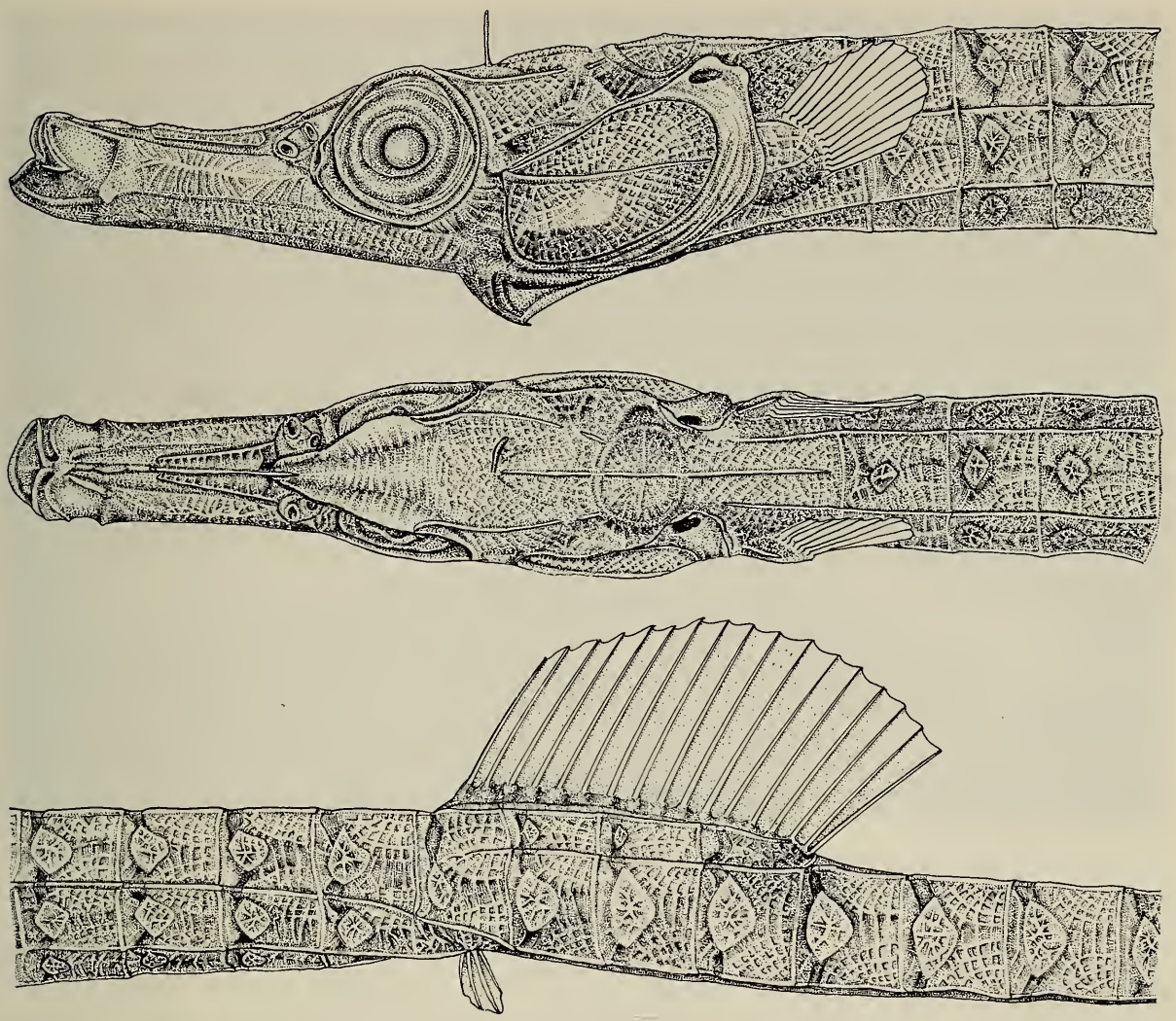

Fig. 12. *Micrognathus natans*. Lateral and dorsal aspects of head and anterior trunk rings, together with section of body illustrating ridge configuration and dorsal and anal fins. From 42.5 mm SL, female or juvenile male, paratype (GCRL 18238).

Diagnosis.—Trunk rings modally 14, principal ridges not angled laterad on distal half of tail, dorsal-fin rays usually 17, subdorsal tail rings usually 3.75–5.0, snout length averages 2.3 in HL, anal ring depth averages 4.8 in HL, side of trunk without dark blotches above lateral ridge, opercle without dark spots or irregular narrow bars.

Description.—Rings 14–15 + 27–31 (14 + 27–31 in 92%), dorsal-fin rays 16–18, pectoral-fin rays 12–15 (modally 13), anal-fin rays 3–4 (usually 4), subdorsal rings 0.5–0.0 + 3.5–5.0 = 3.75–5.0 (see Tables 1–3 for additional counts). Proportional data, based on 10 specimens, 36.0–45.0 ($\bar{x}$ = 40.5) mm SL, follow: HL in SL 6.9–7.8 (7.4), snout length in HL 2.2–2.5 (2.3), snout depth in snout length 2.9–4.0 (3.4), length of dorsal-fin base in HL 1.6–1.8 (1.7), pectoral-fin length in HL 4.8–5.4 (5.1), length of pectoral-fin base in pectoral-fin length 1.4–2.0 (1.7), anal ring depth in HL 4.3–5.2 (4.8), trunk depth in HL 3.1–3.7 (3.4). Measurements (mm) of holotype (AMS I.20390-012) are: SL 36.0, HL 5.2, snout length 2.1, snout depth 0.7, length of dorsal-fin base 3.1, pectoral-fin length 1.0, length of pectoral-fin base 0.6, anal ring depth 1.2, trunk depth 1.6. Longitudinal oper-

Fig. 13. Top, *Micrognathus natans*, AMS I.20390-012 (36 mm SL, immature male, holotype); Bottom, *M. erugatus*. MZUSP 9408 (64 mm SL, presumed female, holotype).

cular ridge usually complete; subdorsal portion of superior trunk ridge usually arched a little dorsad (Fig. 12), principal tail ridges not angled or flared laterad (Fig. 1a), the posterior angles of rings not produced to hook-like points; dorsal-fin origin often on tail, between anterior margin and middle of 1st tail ring in 24% of specimens examined.

Holotype (Fig. 13) shaded or mottled with light brown microchromatophores on tan ground color; dorsum and upper half of side of trunk with irregular, diffuse, pale bars on 4th, 8th and 12th rings; tail more or less encircled with similar markings on 6th, 9th, 13th, 18th, 19th, 22nd and 26th rings. Distal margin and basal third of dorsal fin hyaline; remainder of fin with a broad brownish stripe, markings dark on anterior 8–10 rays but diffuse elsewhere. Pectoral and caudal fins largely hyaline, anal-fin rays lined with brown. Coloration of other recently preserved material similar to that of holotype, except for absence of the dorsal-fin stripe and presence of brown shading on the caudal fin.

Comparisons.—The combination of modally 14 trunk rings and 17 dorsal-fin rays, long snout, and essentially straight tail ridges (Fig. 1a) distinguishes *M. natans* from all congeners. It further differs in usually having fewer subdorsal trunk rings (0.5–0.0 versus 1.75–0.25) and more pectoral-fin rays (12–15 versus 9–13) than its congeners. The snout length of *M. natans* most closely approaches that of *M. micronotopterus* but the snout is more slender in *M. natans* (snout depth in snout length averages 3.4 versus 2.6 in *micronotopterus*). Additionally, *M. natans* has a lower average HL in SL ratio (7.4 versus 8.3) and somewhat greater numbers of subdorsal tail rings (3.5–5.0 versus 2.25–3.75) than *M. micronotopterus*.

Remarks.—The holotype has a moderately long, slender, dermal flap near the anterior end of the frontal ridge and there are short flaps located above the eye, somewhat mesiad of the margin of each supraorbital ridge. The head bears other single, short flaps on the opercular, prenuchal and nuchal ridges. The body has short flaps, paired bilaterally, on the dorsum of the 2nd, 5th, 9th, 10th and 13th trunk ring, as well as on the dorsum of some tail rings. A few minute flaps are also present on the lateral trunk and inferior tail ridges. Among other material, most of the larger specimens have some head or body flaps, but these are usually absent from specimens smaller than about 35 mm SL.

The holotype is the only examined specimen with evidence of brood-pouch development. This immature fish lacks pouch-protective plates but bilateral pouch folds are developing on the venter of the anterior 10–11 tail rings.

Distribution.—*Micrognathus natans* is known from the Philippine Is., the Queensland coast of Australia, the vicinity of New Caledonia and the Fiji Is. (Fig. 5). Collection data for the holotype are incomplete but it was probably taken at the surface with a nightlight and dipnet (B. Carlson, pers. comm.). Most of the paratypes were taken with midwater trawl, neuston nets, or 2 m stramin nets (*Dana* material) in the upper 0–800 m over depths of 450–3490 m.

Etymology.—Named from the Latin *natans,* swimming or floating, in view of the occurrence of most, if not all, known specimens in the upper portions of the water column.

Micrognathus erugatus Herald and Dawson
Fig. 13

Micrognathus erugatus Herald and Dawson, 1974:27, fig. 1 (orig. descr.; S of Arembepe, Bahia, Brazil).

Diagnosis.—Trunk rings 20, principal tail ridges not angled laterad, snout length 3.1 in HL, anal ring depth 3.5 in HL.

Description.—Rings 20 + 36, dorsal-fin rays 19, pectoral-fin rays 13, anal-fin rays 2, subdorsal rings 0.5 + 4.5 = 5.0. Measurements (mm) of holotype follow: SL 64.0, HL 5.9, snout length 1.9, snout depth 1.0, length of dorsal-fin base 4.9, pectoral-fin length 1.1, length of pectoral-fin base 0.7, anal ring depth 1.7, trunk depth 1.9. Opercular ridge of holotype crosses about half of opercle length and angles somewhat upward toward gill opening. Head with short, simple, dermal flaps above opercle and on supraorbital and opercular ridges; trunk and tail without dermal flaps.

Holotype (Fig. 13) dark brown, mottled with pale; trunk and tail with 15 diffuse dark bars crossing dorsum and upper part of side; dorsal fin pale, except for brown streaks near bases of fin-rays; caudal fin brownish with pale distal margin.

Comparisons.—This western Atlantic species is readily distinguished from Indo-Pacific congeners by its high number of trunk rings (20 versus 14–17) and by higher numbers of tail and total rings (Table 1). The essentially straight tail ridge configuration of *M. erugatus* (Fig. 1a) is shared with three Indo-Pacific congeners (*andersonii, micronotopterus, natans*) but it further differs from these species in a number of proportional features (see descriptions).

Remarks.—Absence of spines on the head, absence of lateral snout ridge, presence of a low, entire, median dorsal snout ridge, together with close agreement with congeners in most meristic and proportional features constitute reasons for

retention of this species in the genus *Microgнathus*. This decision is somewhat tentative, since *M. erugatus* is presently known only from the holotype, and study of additional material could result in reevaluation of the relationships of this species. Occurrence of a western Atlantic species of a genus of pipefishes otherwise restricted to the Indo-Pacific region is unusual but not without precedent. The genus *Penetopteryx* Lunel is represented by *P. nanus* (Rosén) in the western Atlantic and by *P. taeniocephalus* Lunel in the Indo-Pacific.

Distribution.—Known only from the Brazilian state of Bahia, southwestern Atlantic Ocean.

Material examined.—Holotype, MZUSP 9408, 64 mm, presumed female, *ca.* 1 km S of Arembepe (*ca.* 12°45′S, 28°10′W), Bahia, Brazil, tidepool, 0–1.3 m, 26 Aug. 1972, C. E. Dawson and party.

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